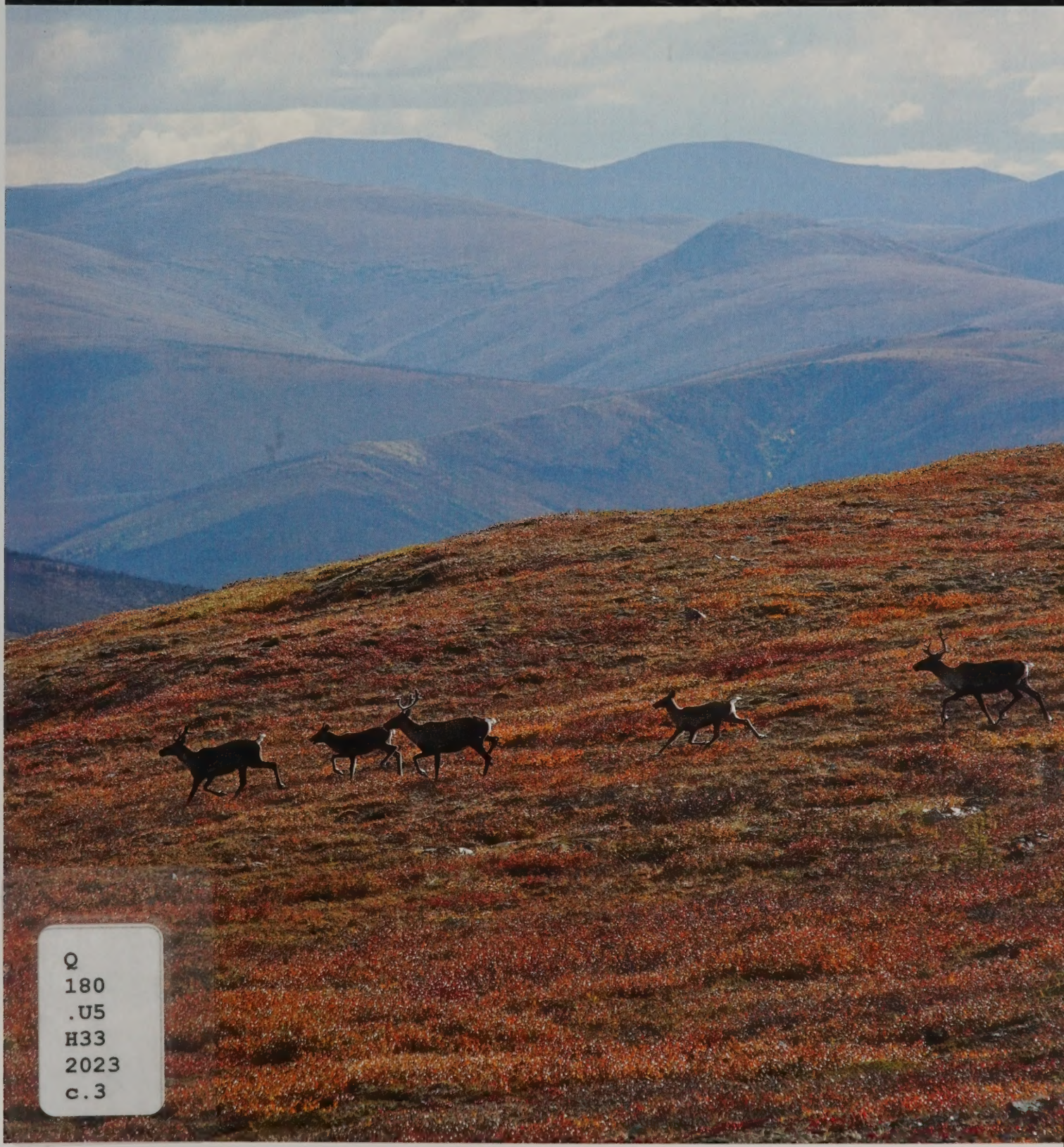
NATIONAL CONSERVATION LANDS

Strategic Science Plan

Steese National Conservation Area and White Mountains National Recreation Area



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Section 1. Introduction and Scientific Mission

The Steese National Conservation Area (NCA) and White Mountains National Recreation Area (NRA) were established under the Alaska National Interest Lands Conservation Act of 1980 (ANILCA). ANILCA identified lands and waters in Alaska that contain nationally significant natural, scenic, historic, archaeological, geological, scientific, wilderness, cultural, recreational, and wildlife values and designated units, including the Steese NCA, for the purpose of preserving them for the benefit of present and future generations. The National Landscape Conservation System (NLCS) was administratively established in 2000 and legislatively codified in the Omnibus Public Land Management Act of 2009 (PL 111-11). PL 111-11 added the Steese NCA to the NLCS. Explicit components of Bureau policy regarding management of NLCS units include: using the best available science in managing the units; supporting a robust basic and applied science program for the NLCS; developing science strategies encompassing values of substantial scientific interest; promoting NLCS units as sites for scientific research; engaging youth and citizen scientists; using NLCS units as laboratories for testing innovative land management practices consistent with the conservation, protection, and restoration of the values for which the unit was designated; and making findings from such research available to the scientific and educational communities.

The Federal Land Policy and Management Act of 1976 (FLPMA) directs the Bureau of Land Management (BLM) to manage the public lands for multiple use and sustained yield except where a tract of public land has been dedicated to specific uses according to any other provisions of law. FLPMA provides a five-part definition of multiple use that includes accounting for the long-term need for scientific values and managing resources without permanent impairment of the productivity of the land and the quality of the environment. Science conducted in the Steese NCA aids in understanding ecological systems, drivers of environmental change, impacts from human activities, and mitigation measures for those impacts to inform multiple use management of BLM-managed lands in general. Strategic planning is essential to identify and acquire science needed to address management issues, communicate those needs to science providers, and incorporate the results into the decision-making process.

The objectives of the strategic science plan for the Steese NCA and White Mountains NRA are to:

1. Identify the scientific mission of the unit.
2. Summarize past scientific data in the unit.
3. Identify management issues and priority needs that can be addressed by scientific study.
4. Develop a strategy to promote and accomplish studies and integrate findings into management decisions.
5. Create a system to organize scientific reports and communicate findings to the public.
6. Develop science protocols that ensure scientific inquiry doesn't negatively impact the unit and its resources.

The science plans of NLCS units are considered 'living' documents and should be revised and updated frequently (e.g., 3-5 years). Scientific needs that emerge while implementing a science plan may be added to the plan on an as-needed basis to meet the unit's scientific mission.

Unit Description

The 1.22-million-acre Steese NCA was designated by Congress through ANILCA in 1980 to protect its outstanding values, including Birch Creek (now named Ikhèenjik River) and caribou range. Section 401 (a) of ANILCA establishes the Steese NCA to provide for the immediate and future protection of these lands within the framework of multiple use and sustained yield and for the maintenance of environmental quality. ANILCA identifies Ikhèenjik River and caribou range as special values to be considered in management of the Steese NCA. In adding the Steese NCA to the NLCS, the Omnibus Public Land Management Act of 2009 explicitly stated that it did not enhance, diminish, or modify the purposes established in ANILCA. However, the overarching purposes of the Omnibus Act in establishing the NLCS and of ANILCA in establishing the National Conservation Area (NCA) are sufficiently similar that management under the NLCS framework is fully compatible with the provisions of ANILCA:

> ANILCA, Sec. 101(a) "In order to preserve for the benefit, use, education, and inspiration of present and future generations certain lands and waters in the State of Alaska that contain nationally significant natural, scenic, historic, archeological, geological, scientific, wilderness, cultural, recreational, and wildlife values, the units described in the following titles are hereby established."
>
> Omnibus Public Land Management Act of 2009, Sec. 2002(a) "Establishment. – In order to conserve, protect, and restore nationally significant landscapes that have outstanding cultural, ecological, and scientific values for the benefit of current and future generations, there is established in the BLM the NLCS."

Bureau policy (MS 6100) establishes responsibility at the BLM Director level to "ensure that conserving, protecting, and restoring the values for which NLCS units were designated are the highest priorities in the planning for and management of these lands."

While the Steese NCA is the focal point for this science strategy plan, the adjacent and overlapping NLCS units and other special designated units that are geographically, ecologically, culturally, and socially intertwined with the Steese NCA are considered in the scope of this science strategy plan as they pertain to managing the unit as part of the landscape. These include:

- Birch Creek Wild and Scenic River (WSR) (including portions outside the Steese NCA)
- Pinnell Mountain National Recreation Trail
- Big Windy Hot Springs Research Natural Area (RNA)
- Mount Prindle RNA
- White Mountains NRA
- Beaver Creek WSR (within the White Mountains NRA)
- Serpentine Slide RNA (within the White Mountains NRA)

- Limestone Jags RNA (within the White Mountains NRA)

ANILCA designated the first 126 miles of Birch Creek as a WSR and classified the entire length as Wild pursuant to the Wild and Scenic Rivers Act. The first 77 miles flow through the south unit of the Steese NCA. Birch Creek WSR is recognized both regionally and nationally as an accessible, whitewater wild river, providing a unique multi-day primitive floating and camping experience. Put in and take out is possible from the Steese Highway. Beaver Creek WSR is the next significant drainage located to the west of Ikhèenjik, located in White Mountains NRA and also classified as Wild. Both rivers are managed for a semi primitive experience. To best manage these WSR's, increased data and knowledge of user experiences and outcomes along with their impacts to the environment is essential.

The current management objectives for Birch Creek WSR in its entirety are (BLM 1983):

- Protect valid existing rights and future rights granted pursuant to appropriate federal and State laws.
- Preserve the river and its immediate environment in its natural, primitive condition.
- Preserve the free-flowing conditions of the waters.
- Protect water quality and quantity.
- Provide high quality primitive recreational opportunities for present and future generations.
- Provide a variety of opportunities for interpretive, scientific, educational, and wildlands-oriented uses.
- Assure protection of significant historic and archaeological values.
- Maintain and improve fish and wildlife habitat.

The largely remote Steese NCA is accessible from the Steese Highway (Alaska Route 6) or by air. State of Alaska lands isolate the units from direct access from the Steese Highway (Figure 1). A few primitive roads lead from the highway to the boundary of, or a short distance into, the Steese NCA. The closest access point from Fairbanks into the Steese NCA is a rugged off-highway vehicle (OHV) trail near Milepost 80.

The public uses the Steese NCA and vicinity for a variety of recreational opportunities. Participation in hunting and trapping in the Steese NCA and White Mountains NRA is high. Species that are commonly hunted in the Steese NCA include caribou (*Rangifer tarandus*), Dall sheep (*Ovis dalli dalli*), moose (*Alces alces*), black bear (*Ursus* americanus), brown bear (*Ursus arctos*), rock ptarmigan (*Lagopus muta*), willow ptarmigan (*Lagopus lagopus*), spruce grouse (*Falcipennis canadensis*) and ruffed grouse *(Bonasa umbellus).* Species targeted by trappers include wolves (*Canis lupus*), wolverine (*Gulo gulo*), Canada lynx (*Lynx canadensis*) and pine marten (*Martes americana*). Other recreational activities include hiking, backpacking, camping, berry picking, snowmobiling, wildlife viewing, and recreational gold panning.

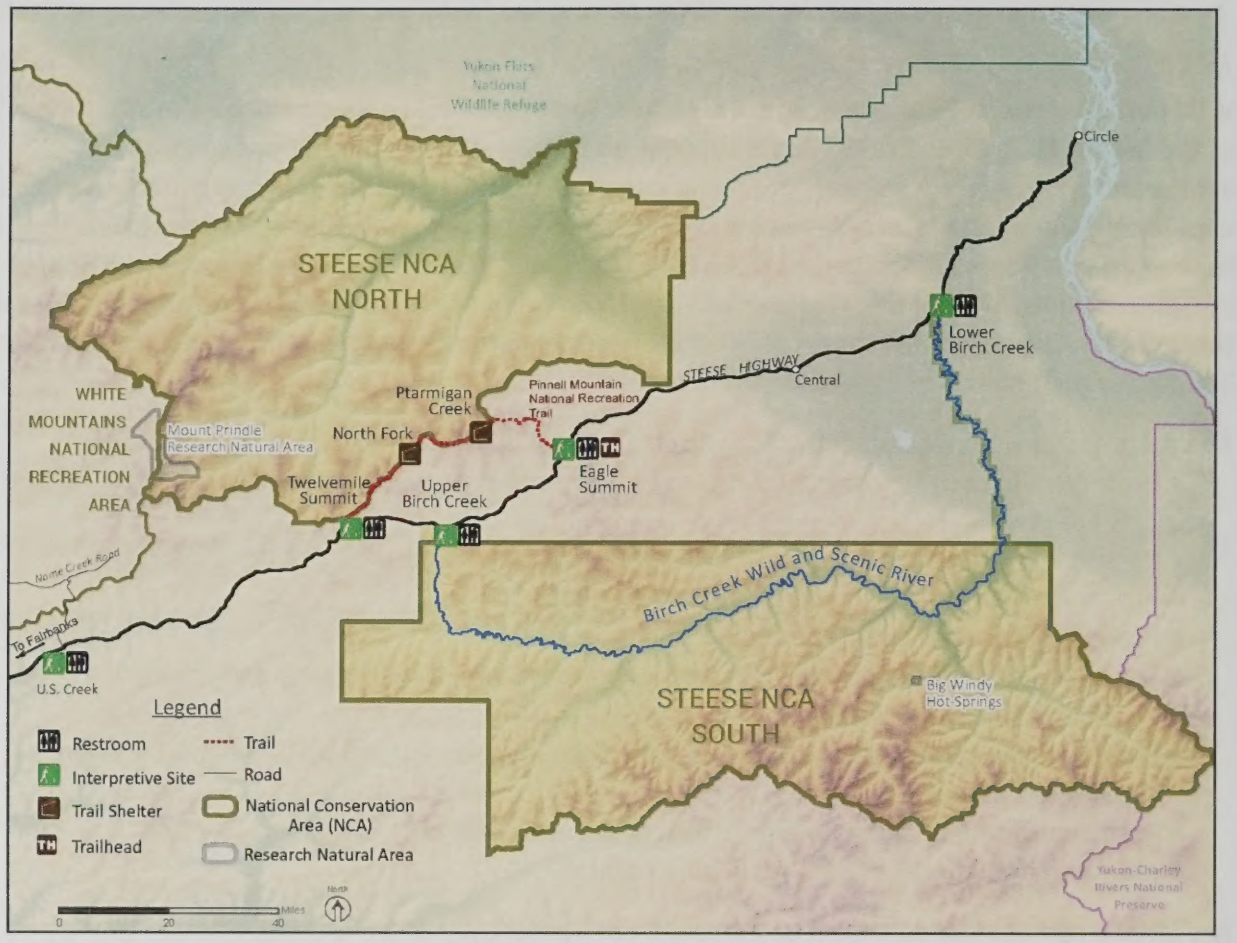

Figure 1: Map of Steese NCA north and south units and adjacent ANILCA-designated units and areas.

There are several developed motorized and non-motorized trails in the Steese NCA and the White Mountains NRA. Except for RNAs, Birch Creek WSR, and Primitive areas, the Steese NCA has long been open to summer and winter use of OHVs under 1,500 pounds gross vehicle weight. Most travel in the area has been cross-country or on undeveloped trail networks. BLM recently completed a Travel and Transportation Management Plan for the area. The plan limits most summer OHV use to designated routes. Improved travel management calls for better understanding of building and maintaining travel routes in these areas, impacts from modern recreational vehicles in alpine tundra and permafrost environments, and effectiveness of mitigation and restoration methods in these environments.

There are two RNAs within the Steese NCA: Big Windy Hot Springs and Mount Prindle. An RNA is "an area that is established and maintained for the primary purpose of research and education" (43 CFR Subpart 8223). In general, occupancy, construction, or maintenance of facilities in an RNA is not allowed except as permitted by law, other federal regulations, or authorized under provisions of 43 CFR subpart 8233. RNAs are considered a type of Area of Critical Environmental Concern (BLM 2005).

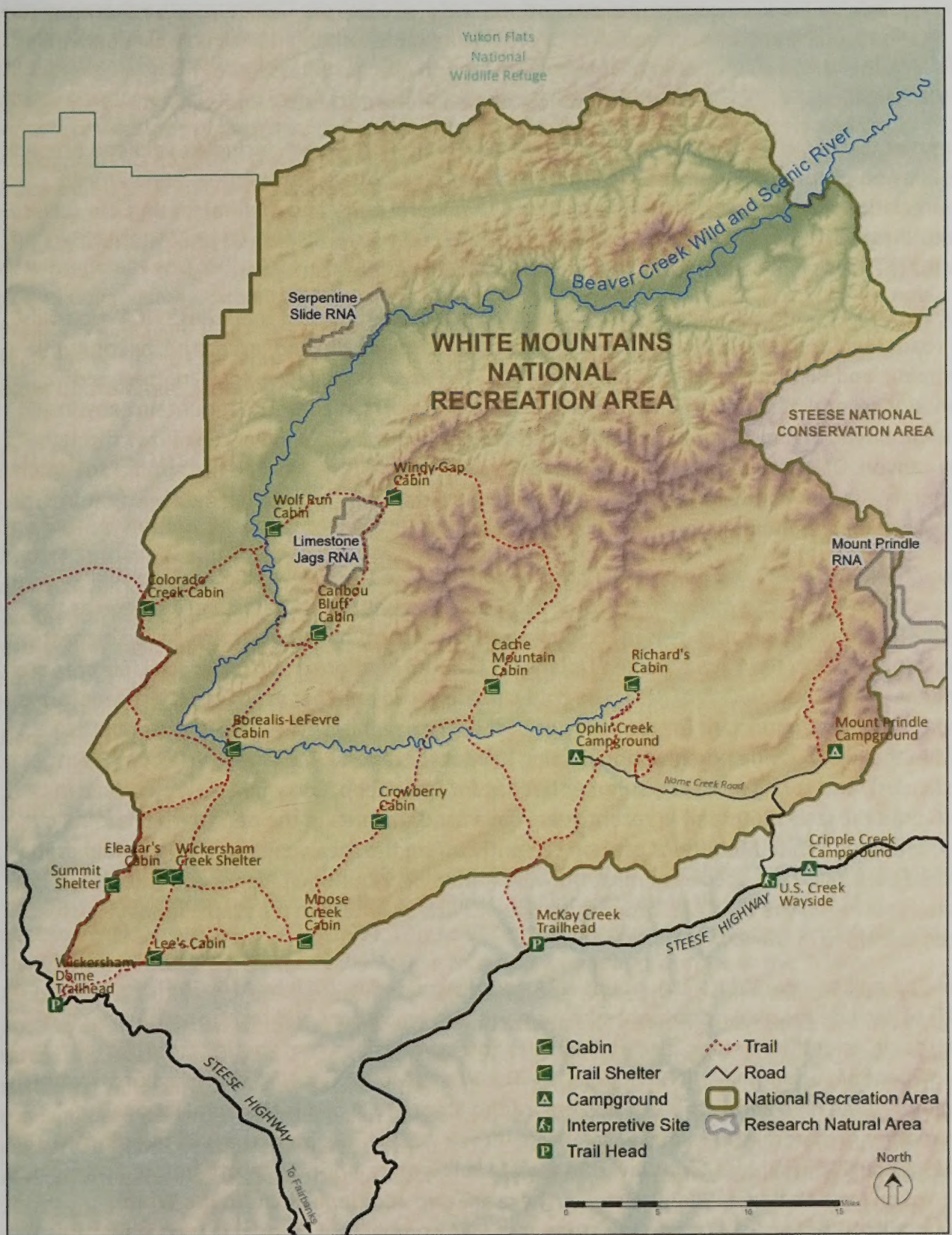

Figure 2. Map of White Mountains NRA boundary and recreational opportunities.

The goals for the RNAs are to (BLM 2016a):

- Provide areas where natural ecosystems and processes are undisturbed so that they can be studied and understood, and to provide an undisturbed area for comparison with other areas so that effects of management and use can be assessed.
- Maintain reference conditions for current and future scientific comparison.

Summer use of OHVs is prohibited in these RNAs. Natural processes, including wildland fire, will be allowed to continue with as little interference as possible. Hiking, hunting, and nature appreciation are allowed. The RNAs are closed to mineral entry and mineral leasing. No surface-disturbing activities allowed except BLM-authorized research projects and primitive hiking trails. The RNAs will be managed for minimal anthropogenic disturbance.

Big Windy Hot Springs RNA (160 acres) is located in the south unit of the Steese NCA. No trails or roads lead to the RNA. No surface disturbing activities are allowed, except hiking, primitive camping, and BLM-authorized research projects. The area is of high geologic interest and contains several medium-grade geothermal seeps and pools in a remote mountain canyon. Thermophytic organisms are associated with the hot springs. Big Windy Creek flows through the canyon. Dall sheep move from alpine zones south of the RNA into the hot springs to obtain mineral salts. Big Windy Hot Springs RNA contains scientifically interesting geologic features, unique plant communities, and rare plants (Juday 1998).

Mount Prindle RNA is on the boundary of the north unit of the Steese NCA and the White Mountains NRA. About 40% of the RNA is within the Steese NCA. Access is very limited as the entire RNA is within an area closed to summer OHV use. Mount Prindle is one of the highest elevation peaks in the Yukon-Tanana Uplands. Glaciated landforms and periglacial features are evident within the 5,960-acre RNA. The cold-climate processes that produced these landforms and features are important for the study of past climate regimes. The cliffs and monoliths within the RNA provide perching and nesting habitat for raptors, including gyrfalcon (*Falco rusticolus*), and spring and early summer habitat for Dall sheep. Fortymile caribou calved in the RNA until the late-1960s and in recent years have used the area in the period from late July through April. White Mountains caribou currently utilize the area year-round. Denseleaf draba (*Draba densifolia) is* a species of mustard with limited distribution in Alaska and the RNA. It is a watch species on the BLM Alaska Sensitive Species list. Several rare moss species have also been identified in the RNA.

The one-million-acre White Mountains NRA was designated in 1980 by ANILCA (Title IV Sec. 403) to provide for public outdoor recreation use and enjoyment and for the conservation of the scenic, scientific, historic, fish and wildlife, and other values contributing to public enjoyment of such area (ANILCA SEC. 1312). The White Mountains NRA shares a border with Mount Prindle RNA and with the north unit of the Steese NCA and is the only National Recreation Area administered by BLM. Beaver Creek WSR, designated as a wild river by ANILCA, flows through the White Mountains NRA for 111 miles of its 277-mile length before flowing into the Yukon Flats National Wildlife Refuge. There are two additional RNAs in the White Mountains NRA. The 5,147-acre Limestone Jags RNA contains old limestone terrain features such as caves, natural bridges, disappearing streams, and cold springs, and a rich diversity of

vascular plants. The 303 species collected in the area represent nearly one-fourth of the flora of Alaska, and the area supports several plant species disjunct from the Rocky Mountains (Juday 1989). The 4,275-acre Serpentine Slide RNA includes an alpine exposure of serpentinite, a 22.23-acre natural earth flow that has destroyed most vegetation in its path, and warm, dry hill prairies on steep south-facing slopes and locally important habitat for grizzly bear. The variety of natural features of geologic, hydrologic, botanic, aquatic, and wildlife interest and the opportunity to monitor natural change in a locally diverse environment make these four RNAs outstanding scientific and educational resources.

The White Mountains NRA provides a variety of recreational opportunities. A developed system of winter trails and cabins provides opportunities for mountain or fat-tire biking, cross-country skiing, dog mushing, snowmobiling, and other winter recreational pursuits. The trail systems are accessible from trail heads off the Elliott and Steese highways. A road from the Steese Highway to Nome Creek provides access to campgrounds and summer use trails in southern parts of the White Mountains NRA.

Unit's Resource Management Plan

The Eastern Interior Resource Management Plan (RMP) Steese NCA and Final Environmental Impact Statement was published in 2016 (BLM 2016). It analyzed five separate management alternatives including a no action alternative. With a range of alternatives emphasizing protection of resource values such as fish, wildlife and vegetation, a moderate level of protection, facilitated resource development, and an alternative that was a mix of values. The staff is now working through the implementation strategies outlined in the RMP, including Travel and Transportation Management Plans, Comprehensive River Management Plans, and Recreation Area Management Plans.

Scientific Mission

The NLCS Science Strategy calls for "identifying science needed to address management issues, communicating those needs to science providers, and incorporating the results into the decision-making process" (BLM 2007). This science strategy plan will provide a reference and framework to conduct science in the Steese NCA and where appropriate in the White Mountains NRA. Priority will be given to scientific efforts that serve to maintain the purpose and values established when the Steese NCA and associated WSRs were created: 1) caribou range and Birch Creek WSR; 2) protection of the lands within a framework of multiple use and sustained yield; and 3) maintenance of environmental quality. Scientific study should inform management decisions to ensure that authorized uses do not negatively impact the Steese NCA conservation missions. In the NLCS, science is defined broadly to "include basic and applied research in natural and social science, as well as inventory and monitoring initiatives" (BLM 2007).

It is the scientific mission of the Steese NCA to:

1. Encourage basic and applied research that can directly or indirectly:

a. inform management decisions, including adaptive management.
b. evaluate management methods.
c. maintain resources and values.
d. maintain ecosystem resiliency and function.
e. maintain diversity and sustained yield of plant and animal populations.
f. preserve and understand cultural and paleontological sites.
g. improve understanding of impacts from authorized uses.
h. improve understanding of impacts from public uses.
i. improve understanding, development, and implementation of best management practices, mitigation measures, and methods to minimize impacts.
j. improve understanding of ecosystem functioning, including basic and applied research.
k. contribute to larger landscape level studies.
l. contribute to long-term monitoring of environmental change, including collection of baseline data.
m. contribute to resource monitoring efforts of other agencies and land managers.

2. Encourage and allow:
    a. long and short-term investigations.
    b. scientific investigations by entities outside BLM.
    c. scientific inquiry across diverse disciplines.

3. Serve as a model for scientific investigation on other BLM-managed lands in the RMP planning area.

The science strategy plan is a dynamic document. Revision and updates are expected to be completed on an approximate five-year review cycle or as needed, such as for emerging scientific needs or information.

Section 2. Science and Sociocultural Background

General Context

Scientific and other studies in the Steese NCA and White Mountains NRA, like much of interior Alaska, have been limited for a variety of reasons. Given the logistical challenges and higher costs associated with conducting research in remote areas, scientific studies have been concentrated in areas that are easier to access and are less cost prohibitive, such as areas immediately adjacent to roads, trails, and floatable waterways. Additionally, some scientists may have been discouraged from conducting studies on the Steese NCA due to real or perceived permitting challenges. Scientists unfamiliar with permitting processes may perceive them as onerous and opt to conduct research in other areas, and some funding sources discourage or disallow paying permitting fees with grant funds. BLM is looking into ways to address these issues.

While past and present research in the Steese NCA is limited, studies have covered a diverse array of topics, including vegetation, wildlife, archaeology, water quality and impacts from mining. The following is a brief overview of the science and sociological background, and description of studies conducted in the Steese NCA.

Climate

The climate of the Steese NCA and White Mountains NRA is continental–subarctic and is characterized by long, exceptionally cold winters, short, relatively warm summers, low annual precipitation, low humidity, and variable winds. Microclimate conditions are influenced by variations in elevation, topography, and cloud cover. Annual mean temperature in nearby Fairbanks (~28°F) is just below freezing and annual precipitation usually varies from about 10 to 30 inches, with upland areas receiving more precipitation than lower areas. The seasonal precipitation pattern is normally at a minimum in spring and at a maximum in late summer (July and August). Summer thunderstorms are common over the hills and upland areas. Summer maximum temperatures range from the upper 70s°F to occasional readings in the 90s° F. Winter temperatures may be minus 50°F or lower for two or three weeks at a time. Snow cover and freezing temperatures typically persist from October through April. Beaver, Birch, and Preacher Creeks normally begin freezing by the first week of October. During at least some winters upper portions of Ikhèenjik River freeze solid. The river remains frozen until spring breakup, which generally occurs in mid-May. Extensive areas of overflow icing (aufeis) are common during late winter creating as much as 12 feet of ice on segments of Ikhèenjik River and some of its tributaries.

Geology

The Steese NCA lies within the physiographic province known as the Yukon-Tanana Uplands. This province contains a complex of primarily mid-grade metamorphic rocks such as quartzite and pelitic schist, with local occurrences of thin and thick-layered marble. The oldest rock unit in this region is the Ikhèenjik River schist of Pre-Cambrian age, a group of metamorphosed sedimentary rocks dominated by quartzite and quartz-mica schists (Mertie, 1937). The Crazy Mountains contain local bands of crystalline limestone roughly 400 to 450 million years old (Mertie, 1937). Structurally, the Steese NCA contains a complex system of intruded metamorphic terranes, fault zones, and volcanic intrusions as the landscape reflects the accretion of Devonian to Mississippian era, volcanic arcs, and back-arc basins (a result of seafloor spreading), while later subduction during the early Permian era (roughly 300 Mya) allowed for sulfide minerals to concentrate in surrounding rocks (Mertie, 1937).

Big Windy Hot Springs is located in the south unit of the NCA. These hot springs consist of several geothermal seeps and pools in a remote mountain area. Big Windy Hot Springs is part of a scattered group of geothermal belts that reside within the eastern interior of Alaska (Juday 1998). The pluton associated with Big Windy Hot Springs intrudes host rock that is principally quartz-mica schist, quartzite, pelitic schist, and marble (Keith et al. 1981). The hot springs are low volume springs measuring only 2 gallons/minute from the largest hot spring and maintaining a temperature near 136° F. The best estimate of reservoir temperature is 307° F and isotope analyses confirm that the major component of hot spring discharge is meteoric (water circulating at depth) and circulates to a depth of 3-3.5 miles before emerging to the surface (Juday 1998).

A study of the glacial landforms of Mount Prindle 62 miles northwest of Big Windy Creek Hot Springs recognized four glacial episodes (Weber and Hamilton 1984), the earliest and the most extensive being Prindle glaciation, which occurred more than 250,000 years ago. Extensive valley glacial deposits of the Prindle glaciation were not covered by later glacial advances. The last two glacial stages are interpreted as representing the Early Wisconsin (earlier than 40,000 years ago) and Late Wisconsin periods (Weber 1986). The area covered by Late Wisconsin glaciation is estimated to be about one fourth of the maximum glacial extent in the earlier glaciations (Weber 1986).

Northern regions of Alaska were covered by vast ice sheets during the late Pleistocene. Most mountain ranges preserve clear moraine depositional evidence. These deposits are rarely datable by ^{14}C, because of sparseness of organic matter or because the moraines are beyond the range of ^{14}C dating. Cosmogenic exposure dating in glaciated settings focuses on moraine boulders and has provided direct ages for dozens of moraines deposited by continental ice sheets and alpine glaciers. Results have helped guide sampling strategy and age interpretations for late Pleistocene moraines elsewhere in Alaska (Briner et al., 2005.)

Burton et al (1981) conducted a study with objective to map the bedrock geology, study the petrology, and investigate the radioactive mineral occurrences in the Mount Prindle area alkaline intrusive complex. The area also lies within the historic Circle Mining District, where metallic minerals, particularly gold, have been mined extensively for over one hundred years (Cobb,1976).

Soils

Most soil resources in the Steese NCA are largely in natural condition with minimal anthropogenic disturbance. On a very broad scale, the Exploratory Soil Survey of Alaska (United States (U.S.) Soil Conservation Service, 1979) mapped four broad soil associations within the Steese NCA: Typic Cryochrepts, Pergelic Cryochrepts, Uthic Cryorhtents, and Histic Pergelic. Brabets et al. (2000) further described these soils and their respective suborders. These are only general descriptions of the specific soil types that may occur in the Steese NCA and were identified through interpretation of vegetation patterns from aerial photography. There may be considerable variation in the specific soil properties within each association. All four of the soil types noted are cryogenic, meaning that they have formed under cold conditions and show cold soil temperatures. Due to the seasonally cold temperatures, the interior Alaska region is underlain by discontinuous, moderately thick to thin permafrost.

Cryogenic soils are generally not suitable for cultivation and may present severe construction or engineering restrictions. Disturbance of the insulating vegetative mat on these soils can also result in permafrost thaw and accelerated erosion. This erosion can appear as gullying, mudslides, slope failures, and other forms of mass movement on sloping terrain. In level areas, thawing may produce thermokarsts, which are areas of local subsidence resulting from the thawing of ice-rich soils. Thermokarsting alters the surface and subsurface hydrology and may result in the formation of wetlands and/ or lakes or ponds.

An updated soil survey and ecological site inventory for the Steese NCA and White Mountains NRA began in 2010 by the Natural Resources Conservation Service at a scale of 1:63,360 (Order 3-4). Final maps and reports are scheduled for completion in 2022.

Vegetation

The Steese NCA and White Mountains NRA support a variety of plant community types. The species composition across the landscape is dependent upon topographic position, microclimate, soils, hydrology, and disturbance patterns. Alpine tundra, tussocks, and boreal forest are among the many different broad ecological types in the Steese NCA. Alpine tundra, found on ridges and mountain tops above the subalpine zone, is characterized by dwarf shrubs, forbs, grasses, sedges, and lichens. Within the alpine zone, hummock features support ericaceous dwarf scrub communities that are often dominated by resin birch (*Betula glandulosa*), bog Labrador tea (*Ledum palustre*), Bigelow's sedge (*Carex bigellowii*), and sphagnum moss. Alpine tussock-scrub polygonal features are characterized by bog Labrador tea, bog blueberry (*Vaccinium uliginosum*), Bigelow's sedge, tussock cottongrass (*Eriophorum vaginatum*), lichen, and sphagnum moss species. On gravel slopes in the alpine, vegetation communities are characterized by eightpetal mountain-avens (*Dryas octopetala*), skeleton leaf willow (*Salix phlebophylla Andersson*), and alpine sweetgrass (*Anthoxanthum monticola*). Solifluction lobes also form on gravelly alpine slopes and support tealeaf willow (*Salix pulchra*), resin birch, and Bigelow's sedge.

Within the subalpine zone, there may be significant quantities of dwarfed black spruce (*Picea mariana*). There are also a variety of scrub plant community types with various willow species (*Salix spp.*), resin birch, and bog blueberry. Subalpine tussocks areas are flat to moderately sloping with poorly drained soils that support a cover of tussocks (clumps of sedges and grasses growing from small mounds), as well as scattered or stunted black spruce.

Lower elevations are characterized by boreal forest plant communities. Boreal forest communities are dominated by white spruce (*Picea glauca*), a mix of white and black spruce or black spruce trees. Black spruce, sphagnum mosses, and scattered shrubs and willows are found in poorly drained areas where permafrost is near the surface. Better-drained hillsides and valley floors are home to white spruce, birch, willow, and aspen.

Vegetation inventories have expanded information on rare plants and plant communities. Juday (1998) assessed the unique vegetative characteristics of the Big Windy Hot Springs RNA, located within the Steese NCA, identifying 37 common plant species in the field during discrete site visits with an additional 69 species being observed, collected, and preserved at the University of Alaska Herbarium. Several unique species of scientific interest in the area include *Phalaris arundinacea*, *Thelypteris phegopteris*, *Viola renifolia*, *Ranunculus cymbalaria*, *Epilobium hornemannii*, and *Gymnocarpium dryopteris*.

Several rare plant and moss species have been identified in the Steese NCA. A comprehensive vegetation assessment of the Mount Prindle RNA found the area contained a rare, yellow-flowered mustard (*Draba densifolia)*, and *Oligotrichum falcatum,* a moss species that was once thought only to inhabit the Brooks Range (Juday, 1988). The area also supports variations of granite tundra, and several species common to those communities including lichens, mosses, willows, sedges, and various types of shrubs (Juday, 1988).

Considerable collection and documentation of rare plants has also occurred in the vicinity of Eagle Summit. The EIFO organized surveys in more remote areas of the Steese NCA (Parker et al. 2003). Further data collection related to these plant communities can help to determine conservation status of rare species.

Invasive species have been inventoried throughout the Steese NCA. Common invasive species that have been recorded include foxtail barley (*Hordeum jubatum*), common dandelion (*Taraxacum officinale*), quackgrass (*Elymus repens*), smooth brome (*Bromus inermis*), bird vetch (*Vicia cracca*), pineapple weed (*Matricaria discoidea*), common plantain (*Plantago major*), oxeye daisy (*Leucanthemum vulgare*), and white sweet clover (*Melilotus albus*).

Water Resources

Major hydrologic resources include Preacher Creek in the north unit of Steese NCA and Birch Creek WSR and the Big Windy Hot Springs RNA in the south unit of Steese NCA. As part of ANILCA, Congress directed the BLM to consider Birch Creek special value in management of the Steese NCA and designated 126-mile-long river corridor as a WSR, 77 miles of which are within the south unit of Steese NCA. A WSR Inventory was conducted during the development of the Eastern Interior RMP to evaluate waterways for eligibility for designation as a WSR. Big Windy

Creek in the Steese NCA was found to possess outstanding remarkable scenic, geologic and wildlife values. Fossil Creek in the White Mountains NRA was found to possess outstanding and remarkable scenic and geologic values.

Birch Creek WSR

Birch Creek WSR is recognized regionally and nationally as an accessible, whitewater wild river, providing a multi-day primitive floating and camping experience that is considered unique. The presentation of diverse geological values along Birch Creek WSR is unique within the region.

Preacher Creek

Limited baseline monitoring of water quantity and quality was completed in 2017 at selected Preacher Creek locations by BLM resource personnel. Data are available in the BLM AQUARIUS database but have not been published. Placer mine impacts to the Preacher Creek watershed are limited to headwater streams including Bachelor and Loper Creeks. Continued monitoring and adaptive management is essential to ensure that water quality and quantity is protected and that any adverse impacts are mitigated.

Big Windy Hot Springs RNA

The Big Windy Hot Springs RNA is a 160-acre remote undeveloped hot spring system within the southern unit of Steese NCA. All other hot springs in central Alaska are located west of Fairbanks, and most are either developed or have been modified in a way that has substantially disturbed natural geologic features and vegetation. Within the Big Windy Hot Springs RNA, precipitation of dissolved minerals from spring water led to the formation of travertine structures and pools and altered granite into an uncommon mineral form (Juday 1996).

Mining Impacts on Steese NCA Water Resources

Mining activity may impact water quality and fish and aquatic resources within the Steese NCA, upstream, and adjacent to the Steese NCA boundary. For example, Ikhèenjik River (formally named Birch Creek) water resources have been impacted by mining operations. Early gold operations mined streambed gravels with little or no reclamation and extensive placer mining for gold has occurred in the Ikhèenjik River drainage since the late 1800s. Upper Ikhèenjik River and several small tributaries, located primarily on State of Alaska land, have been listed under the Clean Water Act as impaired waters for excessive turbidity. Placer-mining operations that lacked erosion and effluent control measures have been the principal cause of elevated turbidity levels. Although recent regulatory enforcement has improved water quality downstream of active mines, protecting Birch Creek WSR water quality continues to be a substantial challenge. Several studies have documented impacts of excess sediment and elevated turbidity in sections of Ikhèenjik River adjacent and downstream from abandoned and current placer mine operations. The U.S. Geological Survey (USGS) report by Kennedy and Langley (2007) includes a compilation of previous studies by various agencies related to mining impacts on Ikhèenjik River.

Monitoring, enforcing mitigation measures, and implementing improved mining and reclamation techniques is necessary to reduce adverse impacts to the resources within and

adjacent to the Steese NCA. Abandoned placer mines need to be reclaimed by reestablishing native vegetation and restoring channels to a more natural and stable form.

Multiple studies have been conducted to collect data on stream flow, assess impacts of placer mining on stream hydrology and water quality, and evaluate stream restoration techniques in the Steese NCA (Kennedy and Langley 2007, Sterin et al. 1998, Kostohrys and Sterin 1996, Bjerklie and LaPerriere 1985, Mack and Moorman 1986, Mack et al. 1988. Madison 1981, Packee 1994, Ray 1990, USEPA 1996, Vohden 1999, Weber 1986). Similar hydrological studies have been conducted in the White Mountains NRA (Kostohrys 2005, 2007, Kostohrys and Sterin 1994). The BLM and USGS cooperatively operated a stream gage at Beaver Creek above Victoria Creek 2009 – 2012.

Special Status Species

BLM Special Status Species Manual 6840 (2008) states that Species designated as Bureau sensitive must be native species that occur on BLM lands, and for which BLM has significant management capability to affect their conservation status. In addition, one of the following two criteria must also apply:

1. There is information that a species is known or predicted to undergo a downward trend such that viability of the species or a distinct population segment of the species is at risk across all or a significant portion of its range.
2. The species depends on ecological refugia, specialized habitats or unique habitats, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk.

Alaska BLM Special Status Species list (2019) includes Federally listed Threatened, Endangered, or Candidate species as well as species considered to be Sensitive by BLM-Alaska. There are no Threatened, Endangered, or Candidate species known in the Steese NCA. The little brown bat (*Myotis lucifugus*), which could possibly occur in the Steese NCA, is currently under consideration for listing by the U.S. Fish and Wildlife Service (USFWS).

The following special status species have been documented or are likely to occur within the Steese NCA: olive-sided flycatcher (*Contopus cooperi*), rusty blackbird (*Euphagus carolinus*), whimbrel (*Numenius borealis*), mayfly (*Acentrella feropagus*), Ashton cuckoo bumble bee (*Bombus bohemicus*), northern yellow bumble bee (*Bombus distinguendus*), Kluane bumble bee (*Bombus kluanensis*), confusing bumble bee (*Bombus perplexus*), Alaska endemic mayfly (*Rhithrogena ingalik*), Alaskan brook lamprey (*Lampetra alaskensis*). The Alaska endemic mayfly was identified from only one specimen collected on Ikhèenjik River about 10 miles upstream of the Steese Highway bridge at mile 147. However, because it is only identified using characteristics of adults (which are not often collected), it likely occurs more widely, and additional inventory is needed. Special status plant species known to occur in the Steese NCA include Porsild's bluegrass (*Poa porsildii*) and Bostock's miners lettuce (*Montia vassilievii ssp. vassilievii*). Mackenzie's river douglasia (*Douglasia arctica*) occurs in the adjacent White Mountains NRA. Watch List plants occurring in the Steese NCA or the Eagle Summit area include

dense leaf draba (*Draba densifolia*) and wedge leaf saxifrage (*Saxifraga adscendens ssp. oregonensis*). The Watch List species glacier buttercup (*Ranunculus glacialis var. camissonis*) occurs in the west side of Mount Prindle in the White Mountains NRA.

Wildlife

Fish and Aquatic Resources

Ikhèenjik River (formally named Birch Creek) and Preacher Creek are classified as anadromous streams. Ikhèenjik River supports up to 12 species of fish including populations of Chinook (*Oncorhynchus tshawytscha*), summer chum (*Oncorhynchus keta*), and Coho (*Oncorhynchus kisutch*) salmon. In 2011, BLM conducted aerial salmon spawning ground surveys along the entire length of the Birch Creek WSR (~125 miles). Chinook and chum salmon were observed, and their locations were mapped.

In 2009-2010, BLM conducted aerial fall and summer salmon spawning ground surveys on the BLM managed portion of Preacher Creek, which is in the northern unit of the Steese NCA. No salmon were observed, but chinook salmon were previously observed in July of 2005. The survey results suggest that the presence of salmon in this region of Preacher Creek may be limited.

Fish inventories were conducted in Preacher Creek (north unit) in 2010 and 2011. Fish captured included arctic grayling, slimy sculpin, and round whitefish. The highest densities of fish were found in areas containing quality pool habitat with slower water velocities. The following habitat data was also collected within the same twelve-mile section of Preacher Creek: riparian vegetation type and condition, spawning gravel condition, large woody debris, pool frequency, pool quality, refugium, percent surface fines, width/depth ratios, streambank stability, floodplain connectivity, and water quality.

The BLM Aquatic Assessment Inventory and Monitoring (AIM) was implemented at 16 randomly chosen and targeted (mined) sites in the Steese NCA in 2014-2015 (BLM OFR 169). AIM data revealed that many of the parameters used to determine stream function were not functioning or functioning at risk at previously mined streams whereas streams that had not been disturbed were functioning.

Fish and aquatic resources are impacted by mining operations. Placer mining has occurred within portions of the Ikhèenjik River drainages of the Steese NCA for over a century, resulting in poor water quality and a reduction in fish habitat in the headwaters and tributaries to Ikhèenjik River. Streams impacted by placer mining are known to be in poor condition, often considered either functionally at risk or nonfunctional. Fish populations in portions of the Ikhèenjik River watershed affected by placer mining have been reduced in size or entirely displaced (Alaska Department of Fish and Game 1985).

As a result of a century of mining, many of the management activities in this area have focused on restoring water quality and improving fish habitat. The BLM undertook a substantial reclamation project in Harrison Creek, in the upper Ikhèenjik River watershed, beginning in

2005. Harrison Creek reclamation is focused on restoring the connectivity of the stream channel to its floodplain, with the intent of reducing the amount of sediment eroding from the stream channel while allowing anadromous and resident fish populations to expand and colonize previously mined areas.

The adverse effects from placer mining in the Ikhèenjik River drainage, specifically elevated turbidity levels, were high enough that in 1992 the Alaska Department of Environmental Conservation included portions of Ikhèenjik River on the list of impaired waters. Increased substrate embeddedness and turbidity resulting from active and abandoned mining claims may directly and indirectly impact fish populations.

Placer mining studies in the Ikhèenjik River watershed found that fish habitat decreased or was eliminated by: (1) channelization that resulted in fewer meanders and decreased stream length; (2) lack of pools, undercut banks, overhanging vegetation, and other features that provide cover for fish; (3) unstable stream banks resulting from bank and channel disturbance and lack of riparian vegetation; (4) decreased suitability of the stream-bottom substrates for fish and invertebrate habitation, and; (5) decreased food sources for the fish as a result of decreased invertebrate populations (Weber et al. 1985). These same deleterious effects of placer mining in active stream channels apply to other mined streams within the Eastern Interior RMP planning area.

Routine site visits to placer mines bordering the southern unit are conducted annually by Field Office fisheries biologists. The purpose of these site visits is to ensure that operations are complying with permit mitigation measures and regulations that are meant to reduce or eliminate the adverse impacts on fish and aquatic habitat. Surface water runoff and general water management at mines continue to be a major challenge for mine operators and land managers. Mining activities often result in the exceedance of state water quality standards in adjacent water bodies. Reclamation or reconstruction of previously mined streams to achieve a stable condition that meets the requirement for rehabilitating fish habitat is a challenge.

Following improvements to mining practices, the upper Ikhèenjik River Arctic grayling population increased in size between 1984 and 1990 (Townsend 1991). Townsend (1996) found that the population of Arctic grayling in Ikhèenjik River increased again between 1990 and 1995 and suggested that future increases would depend on the implementation of reclamation plans, such as improving stream bank and overburden stability and capturing sediments in settling ponds. Preacher Creek, a major tributary to Ikhèenjik River, is generally a pristine system that provides spawning, overwintering, and rearing habitat for Arctic grayling. Degradation of other portions of the Ikhèenjik River watershed from mining activity may increase the importance of Preacher Creek to produce Arctic grayling within the Ikhèenjik River system. Preacher Creek also supports anadromous species such as summer chum and Chinook salmon. Ikhèenjik River supports small populations of Chinook, chum, and Coho salmon, northern pike, sheefish, and other non-game fish species.

Birds

Migratory birds are an important indicator for measuring landscape health. Executive Order 13186 was signed in January 2001 and sets forth actions for Federal agencies to advance consistent treatment of migratory birds and their habitats on BLM lands and during BLM permitted activities. To achieve agency compliance with Executive Order 13186, BLM published a Strategic Plan for Migratory Bird Conservation (BLM IM 2013-119). The Strategic plan recognizes that partnerships in migratory bird conservation have a rich heritage in the U.S. and requires the BLM to address BLM priority migratory birds during the National Environmental Policy Act (NEPA) and planning process, including consistent consideration of national and regional conservation goals and objectives. The conservation goals and objectives are incorporated into the RMPs where appropriate and are implemented with partners.

The Strategic plan directs BLM to support applied research and management studies to identify the habitat conditions needed to conserve migratory birds and to evaluate the effects of management activities on habitats and populations of migratory birds. The plan emphasizes that NLCS units provide unique opportunities as outdoor laboratories to meet the science and research mission of the NLCS in the interest of understanding migratory birds and their habitats.

The USFWS published Birds of Conservation Concern which documents species by Bird Conservation Region in 2021. The Steese NCA falls within Bird Conservation Region IV. Species occurring in the Steese NCA include the solitary sandpiper (*Tringa solitaria*), Short-eared Owl (*Asio flammeus*) and the olive-sided flycatcher (BLM Alaska has also identified the olive-sided flycatcher and whimbrel as a BLM sensitive species).

A breeding bird survey route was surveyed along the Steese Highway (near Nome Creek and Central) annually from 1992 – 2013 by EIFO staff. A total of 76 species were recorded on the Central breeding bird survey route. Two off-road Alaska Landbird Monitoring System plots were established and sampled in 2010 in the White Mountains NRA and 2011 in the Steese NCA. General habitat linkages were also determined (Shaw and Schmidt, 2011).

Inventory and monitoring of cliff-nesting raptors has been conducted sporadically. EIFO conducted float-based inventory and monitoring of raptors along Ikhèenjik River, beginning in the 1980s when peregrine falcons were listed as Threatened and those have been occasionally repeated to monitor trends and assess potential impacts of recreation activities. The U.S. Air Force-funded helicopter surveys of peregrine falcons in Ikhèenjik River (Ritchie and Shook 2011) as part of an assessment of effects of aircraft exercises within Military Operations Areas. EIFO has subsequently conducted three aerial helicopter surveys of cliff-nesting raptors throughout the Steese NCA.

The Steese NCA is a popular place for upland bird hunters to harvest ptarmigan. Since 2015, BLM has partnered with Alaska Department of Fish and Game in the Steese NCA to conduct rock ptarmigan (*Lagopus muta*) and willow ptarmigan (*Lagopus lagopus*) surveys. Results from these studies are used to develop the Alaska Small Game Summary published on Alaska Department of Fish and Game web page. Two research reports from recent rock ptarmigan

studies (Eagle Summit movement, mortality, and comparative nesting ecology) are expected to be available online on the Alaska Department of Fish and Game web site in 2022.

Between 2013 and 2018, Alaska Department of Fish and Game deployed light-level geolocators and archival GPS tags at 7 general study areas on olive-sided flycatchers breeding in boreal Alaska to determine migratory routes, important stopovers, and non-breeding locations (Hagelin et. Al, 2001). Data from 16 individuals revealed a median 14,636 mile annual journey (range: 12,046, 16,958 miles) over 95 days (range: 83, 139 days) with wintering occurring in three regions of South America (NW Colombia/Ecuador, central Peru, and W Brazil/S Peru). This research resulted in the development of a new method to identify "Important Stopovers" for migratory birds along migratory routes.

Mammals

Moose

Moose occur throughout the Steese NCA in elevations below about 3,000 feet (treeline). In summer, pregnant cows may travel long distances to low-elevation areas with abundant wetlands for calving and summer. Radio-collared cow moose from the White Mountains NRA and Steese NCA have traveled up to 100 miles to Tanana flats, Minto Flats, and Yukon Flats (Hobgood and Durtsche 1990, Herriges, unpublished data).

Density of observable moose in the White Mountains NRA and Steese NCA survey area averaged 0.65 moose/mi^2 in 2007 (Herriges, unpublished data). Moose populations in the area may be limited by wolf and bear predation. However, large wildland fires may support population growth by increasing palatable browse. A resource selection function analysis developed for the White Mountains NRA and Steese NCA (Nielson 2007) indicated that 10- to 20-year-old burns were one of the habitat variables most associated with an increased probability of selection by moose in fall.

With the development of the Alaska Interagency Fire Management Plan, fire suppression efforts in the Steese NCA area were reduced from complete suppression to predominantly limited wildland fire suppression. Weather conditions have resulted in record acreages burned in recent years. Large wildland fires in a two-year period (2004 and 2005) resulted in burn perimeters that covered 25.2% of the White Mountains NRA/Steese NCA moose survey area. An aerial moose survey in 1997 prior to those burns estimated 2,270 (+/- 15%) observable moose and a repeat survey post-burn in 2007 estimated 3,019 (+/-24%) for the area. Burned survey units which were surveyed in both years showed an increase of five or more moose per survey unit. These results indicate that either the population had increased, or moose distribution had shifted towards recently burned areas.

Caribou

Two caribou herds occupy the Steese NCA. The smaller White Mountains herd year-round and the larger Fortymile caribou herd seasonally. The White Mountains caribou herd was first recognized in the late 1970s with an estimated 100 to 200 caribou (P. Valkenburg, pers. comm., in Seaton 2007). At that time, the White Mountains caribou herd was believed to be a remnant

of the Fortymile caribou herd because it occurs within the historic range of the Fortymile herd. However, recent analyses confirm that the herd is genetically distinct from the Fortymile herd and other herds to the east (Mager et al 2014, Mager et al, in prep). The range of the White Mountains herd is centered on the White Mountains NRA and north unit of the Steese NCA. Winter range shifted in the 1990s from the west side of the White Mountains NRA and adjacent State lands to the Preacher Creek drainage. An incomplete peak minimum count of the herd was 961 in 1998 (Herriges, unpublished data), but the herd has since declined to less than 500 (Young 2015). Weights of female calves captured for collaring were relatively high, indicating that nutritional status was high and range quality was good.

The Fortymile caribou herd range encompasses most of the Yukon-Tanana Uplands and extends into Yukon Territory. The Fortymile caribou herd (previously known as the Steese-Fortymile caribou herd) was estimated to be over 500,000 caribou in the 1920s (Murie 1935). The herd annually migrated across the Steese Highway into the Steese NCA and eastern White Mountains NRA for calving. The herd declined to an estimated 10,000–20,000 caribou in the 1930s. By the 1950s, the herd had increased to an estimated 50,000 caribou. Between the mid-1960s and mid-1970s, the population experienced a significant decline attributed to high harvests, severe winters, and predation by wolves, reaching a low in 1973–1976 of an estimated 5,740-8,610 caribou (Gross 2015). During this decline, the Fortymile herd reduced range size and changed seasonal migration patterns. By the early 1960s, the fewer caribou crossed the Steese Highway. For about 17 years, the main calving area was in Clums Fork of Birch Creek WSR, before shifting further south and east to current calving distribution.

Between 1990 and 1995, the herd remained relatively stable with approximately 22,000 caribou. During 1996–2002, following implementation of the Fortymile Caribou Herd Management Plan and during a period of favorable weather conditions, the herd doubled in size by 2002. The herd management plan included caribou harvest restrictions, and implementation of non-lethal wolf control from November 1997 to May 2001 and allowed private wolf trapping. The herd continued to grow until 2017. An aerial photo census estimated the herd to number approximately 84,000. The herd expanded its range into more of the traditional range with a slow downward trend in indices of nutritional condition (Boertje et al 2012).

Both caribou herds have been monitored by Alaska Department of Fish and Game or BLM using very high frequency (VHF) radio collars since approximately 1982 (see Boertje et al 2012, Boertje et al 2017, and Durtsche and Hobgood 1990). EIFO collaborated with Alaska Department of Fish and Game and Yukon Department of the Environment to monitor Fortymile and White Mountains herd movements and distribution through GPS collars on caribou since 2010. In 2017, EIFO initiated a cooperative agreement with the University of Montana to investigate the habitat relationships of the Fortymile herd. This collaboration has resulted in several publications (Macander et al 2020, Palm et al. 2022, Orndahl et al 2022, Ehlers et al 2021).

The primary food source for Fortymile caribou in fall, winter and spring are lichens (Ehlers et al 2021). The EIFO, National Park Service (NPS) and Yukon Environment produced a high-resolution map of fractional lichen cover for the eastern interior Alaska and western Yukon

Territory, which was used to characterize caribou habitat use (Macander et al 2020). The approach has been extended to produce other vegetation type fractional foliar cover maps across Alaska and Western Yukon (Nowracki et al 2021, Macander et al 2022). The lichen cover maps were utilized to examine the role of fire and disturbance features in regional caribou habitat selection (Palm et al 2022). Small drones were utilized to estimate biomass of plant functional types (Orndahl et al 2022) that will later be utilized to map plant functional type biomass at the landscape scale in caribou habitats. EIFO initiated a diet and habitat use study using camera collars in 2018. Ehlers et al (2021) utilized this information and a collection of fecal pellet microhistological diet analyses to improve knowledge of diet and examined activity patterns and the effect of insects on foraging activity.

Long-term vegetation inventory and monitoring plots were established in the White Mountains NRA and Steese NCA in 2001 through 2012, primarily to assess caribou habitat. Tree-ring data from this work contributed to a large-scale study of forest productivity/climate relationships (Beck et al 2011).

Much of the Fortymile range lies under Military Operations Areas used for aircraft exercises. Lawler et al (2005) studied reactions of caribou cows during calving to low-level overflights. Reactions observed were mostly mild but were greater as jet speeds increased and slant distances decreased.

Dall Sheep

The White Mountains Dall sheep population occurs across alpine habitats in the White Mountains NRA and along the western edge of the north unit of the Steese NCA in the headwaters of Preacher Creek, including the Mount Prindle and Lime Peak areas and lower elevation bluff habitats that serve as mineral licks. Distribution and movements of White Mountains Dall sheep were examined with VHF radio collars by Durtsche et al (1990) and later by Bertram et al (2018) using GPS collars. Van de Kerk et al included survival data in a regional analysis of Dall sheep survival. Schwafel (2013) utilized blood, hair, and tissue samples from captured animals to examine vitamin and mineral levels and found low of selenium in the White Mountains herd and that low selenium levels increased risk of capture myopathy during capture.

Aerial survey minimum counts of the White Mountains Dall sheep populations have occurred since 1970. These have been conducted cooperatively by Alaska Department of Fish and Game, BLM, and USFWS. The population count decreased from 285 sheep in 1970 to 124 sheep in 1977, and then counts gradually increased to a peak of 717 sheep in 1999 before declining. (Nelson 2019, Bertram et al 2018). The West Point sheep population utilizes the Puzzle Gulch and Big Windy Creek drainages in the south Steese NCA. An average of 142 sheep have been counted there in 1999–2002 (Lawler et al. 2004). A small number of sheep also occur around Mount 5580 in the south Steese NCA and headwaters of Granite Creek (Lawler et al. 2004). The White Mountains population, occupying the western edge of the Yukon-Tanana Uplands, has likely been isolated from other populations for many years. At least occasional interchange likely occurs between all other populations of sheep in the Yukon Tanana Uplands and between Alaska herds and those in Canada (Burch and Lawler 2001). Sheep in the Yukon-Tanana Uplands

often have black hairs in their tail and elsewhere in their coat, which likely indicates some genetic influence from Stone sheep (*O. dalli stonei)* subspecies.

Most sheep at Mount Prindle travel 14–21 miles along open ridgetops, tussock meadows, and open black spruce forests (exposing themselves to significant predation risk) to visit mineral licks on Preacher Creek. Although the exact role in individual and population health is not known, mineral licks are typically considered crucial habitats for mountain sheep.
Some Dall sheep in the Mount Prindle area have, in recent years, developed the behavior of consuming urine-soaked soils left by recreationists during summer, presumably for the mineral content. This behavior has included approaching people directly and has apparently also led to seeking of salty human foods. This human urine-seeking behavior is prevalent in some mountain goat populations, such as Olympic and Glacier National Parks, but BLM is not aware of it occurring elsewhere in Dall sheep in Alaska. The close approach to people and campsites by Dall sheep raises the likelihood of contact with domestic pack animals and potentially disease transmission.

Small Mammals
Hoary marmot (*Marmota caligata)* and pika (*Ochotona collaris)* occur in alpine habitats. Arctic ground squirrels (*Spermophilus parryii)* are notably absent from the Yukon-Tanana Uplands alpine habitats; this absence may influence the ecology and abundance of predators relative to other alpine areas of Alaska.

Small mammal trapping by Baltensperger and Huettman (2015) in the 12-mile summit area yielded the highest species diversity among his sample sites in Alaska. Water shrews (*Sorex palustris)* were abundant at Big Windy Hot Springs (Cook et al 1997) and this record represented the most northwestern occurrence at the time.

Little brown bats are known to occur in interior Alaska. No quantitative inventory or monitoring has occurred in the Steese area.

Amphibians
Wood frogs (*Rana sylvatica*) are the only amphibian occurring in the Steese area, but no quantitative inventory or monitoring has been conducted.

Invertebrates
Some site-specific sampling of aquatic invertebrates has been conducted and one bee/pollinator survey at Eagle Summit, but no systematic monitoring has been implemented.

Fire

Fire is a natural ecosystem process that affects plant distribution, permafrost stability, hydrologic regimes, wildlife habitat, carbon emissions, and ecosystem nutrient and energy exchange (Euskirchen et al. 2010, Walker et al. 2019, Jorgenson et al. 2022). Most of the wildland fires occurring in the Steese NCA are caused by lightning. From mid-June through late

July, thunderstorms start wildland fires when environmental conditions facilitate natural ignition. Lightning can occur as early as April and as late as September, however 99% of all lightning strikes occur May through August, while 91% occur in June and July. The fire return interval is the number of years between two successive fire events at a specific place. The fire return interval in forests similar to those of the Steese NCA range 50-150 years for black spruce stands and 90-250 for white spruce stands (Abrahamson 2014, Fryer 2014). EIFO conducted a fire history study (unpublished) in 2001-2002, characterizing stand ages and vegetation of forested sites across the White Mountains NRA and Steese NCA.

The fire regime in Alaska is changing with increased temperatures, longer growing seasons, and more frequent lightning (Kelly et al. 2013, Kasischke et al. 2010, Veraverbeke et al. 2017). Fires are becoming more frequent and cover a larger extent in tundra and boreal ecosystems (Kasischke et al. 2006, Rocha 2012). The frequency and extent of fires in interior Alaska in recent years has increased relative to fire records begun in the 1940s, and large fires occurred in the Steese NCA in 2004 and 2005 (Figure 2). These emerging fire trends have complex implications including increased risk to human health and infrastructure. Wildfire smoke can degrade air quality, which poses a significant health hazard and can limit visibility to travel safely over land and by aircraft (Sandberg et al. 2002, Reid et al. 2016, Cascio 2018, Peterson et al 2022). Managing these threats requires an understanding of historical, current, and future fire regime, effects and hazards.

BLM coordinates with fire scientists, Federal, State and Tribal partners to better understand and manage fire risks and maintain ecosystem services. The Alaska Wildland Fire Coordinating Group's Fire Research Development and Application Committee maintains an Alaska Fire Research Needs List that is periodically updated to reflect current knowledge gaps and priorities (https://www.frames.gov/afsc/partners/frdac). BLM maintains a seat on the Alaska Fire Science Consortium's advisory board (https://www.frames.gov/afsc). These collaborations assist in directing funding and support toward efforts to solve the fire science needs of the BLM.

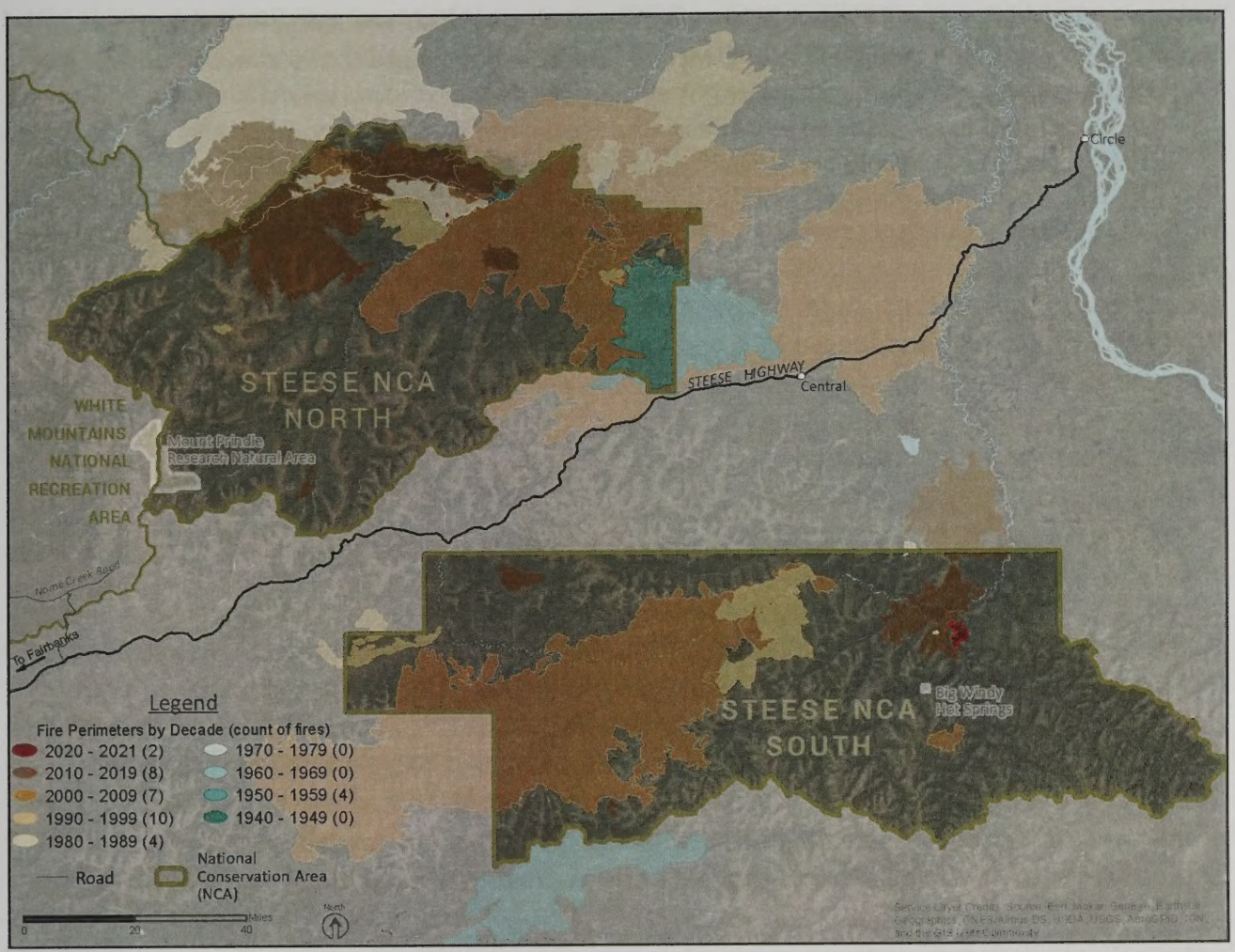

Figure 3. Map of fire history by decade in the Steese NCA.

Paleontology

Several paleontological discoveries have been made within the Steese NCA. Records of the locations of paleontological resources are maintained in the Alaska Paleontological Database (www.alaskafossil.org). The records include vertebrate and invertebrate faunal and floral specimens. Large-mammal vertebrate specimens are concentrated in the Pleistocene epoch (approximately 1.8 million years ago to approximately 10 thousand years ago). No dinosaur fossils have been reported in the area to date. Armstrong (2010) assessed all geological formations in Alaska for significant paleontological resources.

Cultural Resources and Archaeology

Archaeological investigations in the Steese NCA and the White Mountains NRA are limited and began in 1964 by University of Alaska archaeologists in what is now the lower-most portion of the Birch Creek WSR corridor. No further work is known to have occurred in either land unit until the early 1980s, when BLM archaeologists conducted preliminary cultural resources surveys in the newly created Beaver Creek WSR in 1981 and 1982 (Will 1986a) and Birch Creek

WSR in 1983 (Will 1983, 1986b). A BLM cultural survey also occurred along Preacher Creek in the north unit of the Steese NCA, along with reconnaissance-level aerial surveys in portions of both the Steese NCA and White Mountains NRA in 1982.

The BLM cultural program began a regular program of monitoring and surveying throughout the Steese NCA and the White Mountains NRA, including the Birch Creek and Beaver Creek WSRs in the 2000s. Cultural resource surveys occurred along Beaver Creek WSR and Birch Creek WSR by raft (Coffman and Mills 2020; Lanford 2006; Mills 2002, 2009). Helicopter-based and ground-based surveys for cultural resources were conducted most years since 2001 in the White Mountains NRA and Steese NCA and include: a multi-year (2002-2005) focus upon examining karstic features in the Limestone Gulch region of the White Mountains NRA (Mills, Sattler and Bigelow 2014); surveying and testing of prehistoric sites in the Big Bend area of the White Mountains NRA and Bachelor and Cripple Creeks in the Steese NCA (Smith 2010a); a major trails cultural survey in both the Steese NCA and White Mountains NRA (Peterson 2019); a dendroarchaeology project focusing on historic log cabins along both WSRs in 2011 (Grant and Juday 2013); helicopter surveys in the Steese NCA joined with NPS personnel (Mills 2014a, 2014b, 2015); joint BLM-University of Alaska Fairbanks helicopter-based archaeological and paleontological surveys also occurred in portions of the White Mountains NRA and Steese NCA (Mills and Bigelow 2021; Potter 2009, 2011; Potter and Mills 2012); amongst other surveys throughout these areas (Greene 2003; Lanford 2001; Mills 2000, 2006, 2007, 2010, 2011; Smith 2010b). The current goal of the cultural program in the Steese NCA, White Mountains NRA, Beaver Creek WSR, and Birch Creek WSR areas is to continue basic surveying and recording of prehistoric and historic archaeological sites in order to refine and delineate the culture history of these areas by Alaska's historic and prehistoric occupants through time.

Currently, and historically, BLM archaeologists have been the primary investigator of cultural resources inside the confines of the Steese NCA and the White Mountains NRA. With few exceptions, the focus on cultural resource activities inside the Steese NCA and the White Mountains NRA is to conduct inventories of historical and prehistoric archaeological sites. The inventories focus on locating sites, artifacts and features associated with past human practices on these landscapes. Exceptions to this general rule have included test excavations at select sites to identify buried components (e.g., CIR-00191, Bachelor Creek Lookout; LIV-00500, Big Bend Overlook; CIR-00041, Clums Fork site), and the development of a GIS-based predictive model for prehistoric sites in the White Mountains NRA and Steese NCA via a contract with University of Alaska Fairbanks archaeologists (Gelvin-Reymiller and Potter 2009).

There are approximately 45 known archaeological sites within the White Mountains NRA and Beaver Creek WSR, and approximately 106 within the Steese NCA and Birch Creek WSR. More work needs to be done in both units, as full-scale Class III pedestrian survey has occurred on <1% of either land unit, each one of which exceeds one million acres in size.

Landscape Scale Studies

Understanding the condition and trend of socioecological systems at multiple scales is essential to managing the NCA and surrounding lands and resources for climate change resilience and

adaptability. It is the Department of the Interior (DOI) policy to utilize landscape-level approaches, when appropriate, to achieve landscape goals at multiple spatial and temporal scales. The ultimate objective of this approach is to integrate the management of resources across spatial and temporal scales, often across administrative boundaries and political jurisdictions, to enable efficient and effective resource management (604 DM 1). The Steese NCA is situated between, and shares boundaries with 3 other units designated by ANILCA and managed by three federal DOI Agencies: White Mountains NRA, managed by BLM; Yukon Flats National Wildlife Refuge, managed by the USFWS; and Yukon Charlie Rivers National Preserve, managed by NPS. Yukon Flats National Wildlife Refuge is to the north of the Steese NCA and Yukon-Charley Rivers National Preserve and the Fortymile WSR is to the east. The White Mountains NRA is to the west of the Northern Steese unit. The White Mountains NRA is not part of NLCS, however it is a large swath of land that is mostly undisturbed west of the Steese NCA and contains the Beaver Creek WSR. Managing the Steese NCA as part of the larger landscape provides connectivity for the flora and fauna that make up the Northern Boreal ecosystem, provides greater ecosystem services and allows more options for transition to a sustainable state under future climate conditions.

Few landscape-scale studies have been conducted that included the Steese NCA as part of the study area. A report out of the University of Alberta and Yukon College (BEACONS, 2017) that included the Steese NCA and adjacent units demonstrated these areas as being suitable to serve as components of ecological benchmarks based on intactness, climate moisture index, lake edge density, and landcover representation relative to the ecoregion. The Central Yukon Rapid Ecological Assessment (Trammell et. al., 2016) evaluated questions of regional importance identified by land managers, and assessed the status of regionally significant ecological resources, as well as Change Agents that are perceived to affect the condition of those ecological resources. The resulting synthesis of regional information is intended to assist management and environmental planning efforts at multiple scales. Rapid Ecological Assessments have two primary purposes: to provide landscape-level information needed in developing habitat conservation strategies for regionally significant native plants, wildlife, and fish and other aquatic species; and to inform subsequent land use planning, trade-off evaluation, environmental analysis, and decision-making for other public land uses and values, including development, recreation, and conservation.

Beck et. al., 2011 noted that global vegetation models predict that boreal forests are particularly sensitive to a biome shift during the 21st century. This shift would manifest itself first at the biome's margins, with evergreen forest expanding into current tundra while being replaced by grasslands or temperate forest at the biome's southern edge. They evaluated changes in forest productivity from 1982-2001 across boreal Alaska by linking satellite estimates of primary productivity and a large tree-ring data set. Trends in both records show consistent growth increases at the boreal–tundra ecotones that contrast with drought-induced productivity declines throughout interior Alaska. These patterns support the hypothesized effects of an initiating biome shift. Ultimately, tree dispersal rates, habitat availability and the rate of future climate change, and how it changes disturbance regimes, are expected to determine where the boreal biome will undergo a gradual geographic range shift, and where a more rapid decline will exist.

Recreation

The Steese NCA and White Mountains NRA are both designated as Special Recreation Management Areas. The areas are divided into Recreation Management Zone's. The zones are classified ranging from front country to primitive. Each classification has a management prescription to go with it. BLM in coordination with University of Alaska Fairbanks have conducted a Benefits Based Management study and Government Performance and Results Act visitor surveys in the Steese NCA and White Mountains NRA. This study and surveys help BLM to continue better managing the areas and ensuring that it is meeting the management prescriptions for the different zones. In 2011 BLM coordinated with University of Alaska Fairbanks to conduct the Benefits Based Management study. This study was in concert with developing the recreation section for the new RMP. The study helped gather use data and demographics of the recreation resource. In addition, the study identified beneficial outcomes from users through the recreational opportunities and activities they were participating in. This data helped identify niches (markets) and the benchmarks or measuring tools to guide BLM in the best management practices for each zone.

The visitor surveys are sampled in 5-year intervals and measure the general satisfaction of recreation users of the area. A Recreation Area Management Plan is identified as a step-down plan for the Steese RMP. BLM has also seen a steady increase in use by both permitted and non-permitted use in these areas and begun looking into possible use thresholds. Over the past five years BLM has issued 3 new Special Recreation Permit in the Steese NCA, two for guided hunting and one for river float use. The recent development of the Fortymile caribou being found in accessible areas of the Steese NCA during hunting season has sharply increased the use during that time. There has been an increase in the number and disturbance of user created routes, an increase in the use of outhouse facilities and amount of trash generated. BLM has also placed counters out on commonly used sites but is still working to develop better counts.

Subsistence

Subsistence hunting, fishing, and gathering in Alaska is the traditional way of life for many residents of the state and is central to the customs and traditions of many cultural groups. ANILCA defines subsistence as "the customary and traditional uses by rural Alaska residents of wild renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade," and directs that non-wasteful use of fish and wildlife by rural residents (permanent residents of areas determined to be rural by the Federal Subsistence Board) shall be given priority over other uses of those resources.

Historic and contemporary harvest of subsistence resources by communities surrounding the Steese NCA has been documented by Braund (2007), Caulfield (1983), Thomas (2008), Stevens and Maracle (2012), Sumida (1988, 1989), and Van Lanen *et al.* (2012), Brown et al. (2014), and Trainor et al. (2020). Alaska Department of Fish and Game has published community harvest studies which include four communities connected by highway to the Steese NCA (Trainor et al. 2020, Brown et al 2014). Salmon was the primary food resource harvested (43-83% of harvests by weight) in Circle, Minto, and Manley Hot Springs while large mammals were most harvested (45%) by Central residents. Moose was the primary large mammal harvested in all communities. Minto and Manley Hot Springs did not report harvesting caribou in the report year, but many households used caribou obtained from other communities. Both communities reported harvesting caribou in the past when caribou migrated in the area. Most households in these communities used large mammals (72-100%), attempted to harvest large mammals (45-70%), and fewer reported harvesting (24-50%). Almost all households harvested berries and other edible plants, but they generally made up a small part of harvests by weight (2-12%). A high proportion of households harvested firewood. Residents of each community expressed concerns that hunters from outside the community interfered with their hunting opportunities and, in the case of the Fortymile caribou hunt, raised safety concerns, which resulted in one Central resident saying that they don't hunt caribou during the general hunt.

Interviewed residents were asked to draw areas of subsistence search and harvest on maps. Though not a complete picture of the areas of use by the community, they can provide some indication of primary use areas. Harvest maps showed the greatest use of the Steese NCA by Central residents. Mapped use areas of the Steese NCA by Central residents for caribou included only the ridgeline south of Harrison Creek. Moose hunting was documented in the hills between Central and south unit of the Steese NCA. Central residents reported non-salmon fishing on Ikhèenjik River up to Clum's Fork and on Medicine Lake. Use areas mapped for other resources did not include the Steese NCA. Circle residents reported using the Steese Highway for berry picking. Use of the Steese NCA by residents of Minto, or Manley Hot Springs was not documented by Brown et al (2012). However, hunters from Minto were contacted by BLM staff in the Steese NCA during the 2021 Fortymile caribou hunt, and hunters from rural communities across the state have taken part in the Fortymile hunt, indicating a willingness to travel in some situations.

Salmon runs in the Yukon River drainage have recently been some of the worst on record, which resulted in closures and restrictions to salmon harvest the past four years. This has made alternate sources of subsistence foods more important, which could increase use of subsistence resources in the Steese NCA and surrounding areas.

Section 3. Identification of Management Issues and Priority Science Needs

Identification of Management Issues and Priority Science Needs
Science needs within the Steese NCA and White Mountains NRA are developed and prioritized based on issues identified in the Steese Record of Decision and RMP (RMP 2016a) and the White Mountains Record of Decision and RMP (2016b), as well as from BLM and DOI policy. Input from BLM resource specialists, management, and the public may also generate science needs within the units. Management objectives identified in the RMPs were ranked by high, medium, and low priority levels. Science objectives were developed to address the medium and high-ranking management objectives, which are outlined in the Management and Science Objectives table below.

The NLCS Science Strategy calls for "identifying science needed to address management issues, communicating those needs to science providers, and incorporating the results into the decision-making process." This NCA science strategy outlines important science topics to address to obtain the information that will enable effective planning for and responding to the environmental, cultural, and political changes happening in the Steese NCA. This NCA strategy identifies seven thematic Priority Areas derived from direction in law and Department and Bureau policy, and key science objectives to address them. These are 1) Maintain Steese NCA priority resources and values, 2) Ecosystem function, resilience, and landscape connectivity, 3) Sustainable Management of Species and Habitat, 4) Travel and Transportation, 5) Sustainable economies and livelihoods, 6) Hazard Mitigation and Risk Reduction, and 7) Implement BLM AIM Program. The science objectives outlined for each priority area are not fixed in time. Revision and updates to science objectives are expected to be completed on an approximate five-year review cycle or as needed, such as for emerging scientific needs or information. The overarching science objectives for the priority areas are outlined below.

Maintain Steese NCA designated Resources Objects and Values

The purpose of a NCA designation is to ensure Resources, Objects and Values are conserved, protected, restored, and/or enhanced. Resources, Objects and Values are the features and elements specifically identified in the enabling legislation for the unit. The Steese NCA was established under ANILCA. The stated purpose for establishing these units (ANILCA Sec. 101) is "to preserve for the benefit, use, education, and inspiration of present and future generations certain lands and waters in the State of Alaska that contain nationally significant natural, scenic, historic, archaeological, geological, scientific, wilderness, cultural, recreational, and wildlife values." The Congressional intent is "to preserve unrivaled scenic and geological values associated with natural landscapes; to provide for the maintenance of sound populations of, and habitat for, wildlife species of inestimable values to the citizens of Alaska and the Nation, including those species dependent on vast relatively undeveloped areas; to preserve in their natural state extensive unaltered arctic tundra, boreal forest, and coastal rainforest ecosystems; to protect the resources related to subsistence needs; to protect and preserve

historic and archeological sites, rivers, and lands, and to preserve wilderness resource values and related recreational opportunities including but not limited to hiking, canoeing, fishing, and sport hunting withing large arctic and subarctic wildlands and on free flowing rivers; and to maintain opportunities for scientific research and undisturbed ecosystems." ANILCA identified Birch Creek and caribou range as special values to be specifically considered in planning and management of the Steese NCA, and those must be considered in the context of the overall purpose for which ANILCA designated these units when considering Resources, Objects and Values.

BLM Policy requires a Compatibility Determination for any discretionary authorization within an NCA and has developed a Compatibility Analysis Framework for making these determinations. The purpose of the Compatibility Analysis Framework is to clarify the BLMs requirement to ensure management actions are compatible with law, regulation, and policy for National Monuments, National Conservation Areas, and similar designations. The BLM must consider compatibility for proposed actions through the NEPA process and ensure other management actions affecting National Monuments or National Conservation Areas are compatible with the purposes for designation.

Objective: Prioritize conservation, protection, restoration and or enhancement of the Steese NCA special values identified in ANILCA 401b, which include Birch Creek and caribou range.
Science Priorities:

- Develop water quantity/water quality monitoring strategy for Steese NCA watersheds to document natural timing and variability of water quantity/water quality. Work cooperatively with other agencies and stakeholders to develop instream flow water rights for Birch Creek Wild and Scenic River.
- Develop and implement effective Steese NCA and range-wide monitoring program for caribou range. Identify key habitat areas and attributes, potential impacts to those habitats and caribou utilization, and develop mitigation and management strategies.

Maintain Ecosystem Function, Resilience, and Landscape Connectivity

Objective: Given projected climate change scenarios (next 25-50 years), develop a strategy to determine primary risks to maintaining ecosystem function, resilience, and landscape connectivity and evaluate possible methodologies for managing/mitigating risk factors.
Science Priorities:

- Develop ecosystem health assessments, models, and forecasts.
- Increase understanding of how environmental change will affect current and future adaptive capacity and resiliency.
- Develop regional scale monitoring strategies in cooperation with other Federal and State agencies.
- Develop guidance for managing/mitigating ecosystem function, resilience, and landscape connectivity risks.

- Implement BLM AIM methodology for Riparian and Wetland, Wadable and Boatable protocols. Work with National Operations Center and other resource professionals to develop these programs to fit the Alaskan landscape.

Sustainable Management of Species and Habitat

Objective: Maintain natural ecosystem functions and the quality and quantity of habitat to support healthy populations of wildlife.
Science Priorities:

- Develop an inventory and monitoring program to determine presence and abundance of BLM Special Status Species that can be used to measure metrics of species and habitat quality such as change in species range, phenology, and demography.
- Identify and monitor vegetation responses to climate and disturbance. Develop a suite of future condition scenarios for vegetative communities along with relative probabilities (forecasting).
- Implement BLM AIM methodology.
- Inventory and monitor non-native invasive species in the Steese NCA and understand vectors for transmission of non-native invasive species specific to the Steese NCA and surrounding landscape.

Travel and Transportation

Objective: Provide opportunities for a range of motorized and non-motorized uses on public lands while protecting resources and minimizing conflicts among various users.
Science Priorities:

- Understand factors contributing to resource impacts from motorized travel and transportation in the Steese NCA, as well as effectiveness of potential mitigation measures.
- Understand how factors contributing to resource impacts from motorized travel in the Steese NCA may change under expected climate change scenarios.
- Understand drivers of travel and transportation methods and patterns in the Steese NCA, and how they are likely to change based on changes in demography, technology, culture, and environmental conditions.

Sustainable Economies and Livelihoods

Objective: Improve understanding of socio-ecological systems to support sustainable economies and livelihoods.
Science Priorities:

- Visitor use: Conduct studies about visitor use (recreation, subsistence, hunting, energy development), access, visitor satisfaction, and potential user conflicts.
- Improve understanding of community economic and social priorities.

- Subsistence: improve understanding of subsistence resource needs and ability to acquire subsistence resources.
- Improve understanding of availability of subsistence resources, including quality, abundance and geographic distribution of plant, fish, and wildlife resources.
- Improve understanding of requirements, methods, and barriers to access to subsistence resources.
- Understand drivers affecting subsistence use- changes in technology, ease of travel to access subsistence resources, changes to quality and quantity of resources.
- Understand how subsistence needs, uses and access may change in the future. Develop adaptive management strategies to maintain/ improve availability and access to subsistence resources.
- Infrastructure: Assess current and future infrastructure needs, impacts of ecological change and natural hazards on infrastructure, and impacts of infrastructure on ecosystem function, resources values, wildlife, habitat, and visitor use.
- Mineral Resources: improve understanding of mineral resource potential, methods to sustainably develop mineral resources, and methods to mitigate impacts of mineral development.
- Recreation: Provide for multiple recreational uses of the public lands. This includes facilitating a wide range of beneficial outcomes by managing for desired recreational activities, settings, and experiences. (BLM 2016, Section 2.2.20).

Hazard Mitigation and Risk Reduction

Objective: Secure public health and safety through science that seeks to understand risks associated with natural and anthropogenic disturbances and develop strategies to mitigate impacts of hazards.
Science Priorities:

- Conduct assessments of hazards, including fire, erosion, permafrost melt.
- Develop strategies to mitigate hazards and reduce risk.
- Improve understanding of how environmental change will affect current and future hazards and how they can be managed or mitigated.
- Understand how current and future hazards affect infrastructure, transportation, economies and livelihood, and ecosystem function. Develop strategies to manage and mitigate hazards.
- Implement BLM AIM Program
- Implement boatable Aquatic AIM on Birch Creek WSR
- Implement Riparian/Wetland AIM

Please note that this list is not exclusive. Outside research that does not address these BLM-specific priorities is welcome in the Steese NCA and White Mountains NRA but is less likely to be considered for BLM funding. Similarly, the priority rankings are used for funding decisions and are not meant to imply that lower-priority science needs are unimportant.

The science priorities outlined for each priority area represent overarching science themes. A more detailed list of science objectives for each priority are included in the Steese NCA Management and Science Objectives table (see Appendix 3 – Management Objectives and Priority Science Needs). The science objectives are not an exhaustive list of specific research projects. They are more broadly described objectives that will guide tasks such as developing budget requests, funding research proposals, determining whether BLM is meeting the mandates of law, regulation, and policy, and informing adaptive management plans.

Section 4. Meeting Science Needs

Internal Organization

Currently the Steese NCA manager is filling the role of the science coordinator. The role of the science coordinator is to:

1) Coordinate and collaborate to identify and prioritize science needs
2) Serve as the contact person for scientific enquiries
3) Ensure that partners and collaborators are familiar with the science needs and priorities outlined in this plan and to reach out to potential new science partners.
4) Coordinate with staff to expedite, to the greatest extent possible, NEPA planning and permitting for research proposals.
5) Ensure that the results of scientific enquires are made available to BLM staff, in appropriate formats, including progress and final reports.
6) Periodically publish summaries of research efforts to include descriptions of ongoing science and key findings of completed reports to the Steese NCA and White Mountains NRA websites respectively.

It is also expected that the science coordinator will compile and synthesize science from all available sources to provide an overall understanding of resource condition and trends, ecosystem health, socio-cultural context, and landscape resilience to help guide management of the SCNA as a component of the larger landscape.

Collaboration and Partners

A list of partners currently working with EIFO is included below. Additional partnerships to help meet the goals of this science strategy are welcomed.

University of Alaska Fairbanks: BLM biologists have partnered with the University of Alaska Fairbanks to measure the effectiveness of caribou habitat management and changes in vegetation related to climate change. Changes will be evaluated through a program of long-term vegetation monitoring, including fire effects, caribou forage, and monitoring and control of weeds in burned habitats. BLM archaeologists have partnered with the University to provide a model for prehistoric Alaska Native land-use in the White Mountains NRA and along Beaver Creek WSR. In addition, joint BLM- University of Alaska Fairbanks projects have conducted helicopter-based survey and reconnaissance for cultural resources throughout the White Mountains NRA, as well as a survey via rafts along Birch Creek WSR, all with the goal of assessing the degree and extent of past cultural land-use practices throughout the area.

Alaska Department of Fish and Game: Through assistance agreements, BLM and the Alaska Department of Fish and Game have cooperated for many years in inventory and monitoring of wildlife and habitats in the White Mountains NRA and Steese NCA. Projects include aerial moose surveys (including investigation of fire effects), and studies (utilizing radio telemetry and

aerial surveys) of moose, caribou, and sheep numbers, distribution, movements, habitat use, and health status.

U.S. Fish and Wildlife Service (USFWS): The USFWS cooperates annually in conducting an interagency census of the White Mountains Dall sheep herd (with the BLM and Alaska Department of Fish and Game) to monitor population numbers, productivity (lamb: ewe ratio) and distribution. They also cooperated with BLM in a study of White Mountains Dall sheep movements and demography.

Pursuant to Executive Order 13186, 66 Fed. Reg. 3853, (January 17, 2001), entitled "Responsibilities of Federal agencies to Protect Migratory Birds," BLM signed a Memorandum of Understanding (MOU) with USFWS in 2010 to promote the conservation of migratory birds and outline a collaborative approach to promote the conservation of migratory bird populations. Executive Order 13186, 66 Fed. Reg. 3853, (January 17, 2001), directs agencies to take certain actions to further implement the migratory bird conventions, the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act and other pertinent statutes. The purpose of this Memorandum of Understanding is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds through enhanced collaboration between the Parties, in coordination with state, tribal, and local governments. This Memorandum of Understanding identifies specific activities where cooperation will contribute to the conservation of migratory birds and their habitat. These activities are intended to complement and support existing efforts and facilitate new collaborative conservation partnerships and comprehensive planning efforts for migratory birds. This includes joint ventures, planning efforts, and activities of the bird initiatives (North American Waterfowl Management Plan, the North American Waterbird Conservation Plan, the North American Landbird Conservation Plan, the U.S. Shorebird Conservation Plan, and the North American Bird Conservation Initiative).

U.S. Geological Survey (USGS): The USGS and the BLM worked cooperatively on the 2009-2012 project Mercury Research in the Yukon River Basin. The objective of this research focused on the transport, cycling, and export of mercury and carbon in the Yukon River Basin. These activities are the next step in process-based research that addresses questions posed by recent USGS publications quantifying carbon and mercury export from the Yukon River Basin. The study included data collection at the East and West Twin Creek catchments within the Nome Creek watershed supplementing previous research in these catchments focusing on the cycling of carbon. In addition, the BLM and the USGS also conduct cooperative water quality surveys and monitor stream flows. Data are evaluated for systematic changes in water quality and quantity. Continued monitoring is essential to ensure that water quality and quantity is protected and that any adverse impacts to water resources are mitigated. There is an active Interagency Agreement from 2022-2025 for streamgauge operation, which allows BLM to request USGS seasonal monitoring of water quality parameters at streamgauge sites.

University of Alaska Fairbanks Geophysical Institute: The objective of a five-year project that started in 2021 is to develop a better understanding of the local impacts to the permafrost

along the Pinnell Mountain Trail during and after the 2020 RC-860 Fortymile caribou hunt, and to understand the thermal variability of permafrost in the area around the Steese highway. Ten soil temperature stations were installed Summer 2021 perpendicular to the trail to monitor soil temperature at specific depths. This information is shared yearly with the BLM and also maintained in a Geophysical Institute database.

Drone surveys will be flown each year to map and measure the ground surface around the stations and the trail. The data will be used to generate a 3-dimensional map of the area, a 2-dimensional orthomosaic, and a digital elevation map. As more surveys are flown, the digital elevation maps will be used to generate differential elevation maps. These maps will be used to identify any changes to the ground surface over the course of the project. Data from the project will be delivered to the BLM by the end of each year. This timeframe will allow for any discussion about areas that may need attention the following year, and it will show the current progress of the project.

User groups and volunteers: A variety of user groups and volunteers, including Alaska Trails, Interior Alaska Trails and Parks Foundation, Back Country Hunters and Anglers, and several interior Fish and Game Advisory Committees have partnered with BLM to help with monitoring trail and resource conditions as well as executing trail repair and maintenance projects. While these activities are usually conducted as volunteer events rather than through cooperative agreements or with a memorandum of understanding, they are invaluable assets to BLM's capacity for applied science in the Steese NCA.

Section 5. Science Direction and Protocols

General Guidelines

When applying for a permit to conduct research on BLM managed lands, all parties who meet the criteria in Section 3.2 of Departmental Manual 305 DM 3 will be required to read and agree to the Code of Scientific and Scholarly Conduct (see Appendix 2).

BLM provides direction and protocols for inventory, monitoring, and assessing the condition of the BLM managed lands. Commonly used protocols in Alaska are described below.

Vegetation Management Action Portal (VMAP) The Vegetation Management Action Portal (VMAP) is the official BLM system for collecting, storing, editing, analyzing, and reporting all weed and invasive species treatment data. All workflows for entering infestation, survey, proposed and completed treatment data will now go through VMAP. VMAP will house standardized data in one location, including its geospatial representation. It will provide a single national view for all projects and management actions formally associated with legacy systems in one data entry portal, including vegetation treatments, structures, and other activities. In addition to supporting the BLM's decision support & planning processes, this data centralization is also necessary to modernize BLM's data services and technology infrastructure, which is critical to further enabling geospatial data.

VMAP deployed its first release on April 5, 2019. For the Weed and Invasive Species Program, this release included: treatment data fields that were historically collected in the National Invasive Species Management System, mobile field data collection workflows using government furnished Android mobile devices for documenting inventory & treatment actions, and the addition of a workflow to create, review and approve an electronic Pesticide Use Proposal. Weed and invasive species data collectors can enter treatment data directly into the VMAP Web Application or can collect this data in the field using S1 Mobile Mapper for Android application. Fully validated planned and completed treatments are then viewable from within the VMAP web application itself and are also synchronized to the EGIS VMAP publication geodatabase. Invasive species inventory data is also now captured in the field using the S1 Mobile Mapper for Android application. After this field data is validated, invasive species infestation & survey data will reside in the EGIS National Infestation and Survey geodatabase. It is also included in a reference layer in the VMAP web application. Future deployments of VMAP will integrate the electronic Biological Control Agent Release Proposal and associated approval workflows, and the storage of infestation and survey data directly within VMAP.

BLM Assessment, Inventory, and Monitoring (AIM) The BLM AIM Strategy describes an approach for integrated, cross-program monitoring of renewable resources (e.g., vegetation, soils, water, and wildlife habitat) at multiple scales of management. High-quality information on the status, condition, and trend of natural resources is essential for making sound land management decisions that sustain the diverse uses and benefits of public lands. The AIM approach to monitoring features five elements: (1) a standard set of core quantitative

indicators and methods, enabling easy comparison of measurements in different places and over time; (2) a defensible and statistically valid way of selecting monitoring plots that informs land management at multiple scales; (3) integration with remote sensing, providing a bird's-eye view of conditions across the landscape; (4) electronic data capture and management, streamlining information access and application to decisions; and (5) a structured implementation process built on management questions and an understanding of ecosystems. Aquatic (lotic), Terrestrial, and Riparian & Wetland AIM projects are currently being conducted by BLM and partners on BLM-managed lands in Alaska.

Permitting and Tracking Process

Proposals, including those for the NLCS Scientific Studies Support Program, can be submitted to the Steese NCA Manager/ Science Coordinator. Pre-proposal meetings with BLM staff are encouraged. To shorten processing time proposals should include the following:

- Contact information of the principal investigator
- Background information of the question being studied
- Site location(s) including proposed access routes
- Methods/ protocols to be used in conducting the research
- Timeline for fieldwork
- Deliverables

The Steese NCA Manager or Science Coordinator will review proposals for completeness and consult with relevant BLM resource specialists as to the scientific validity and integrity of the proposal, applicability to BLM's science needs, and potential impacts to resources and other user groups. The Authorized Officer, in consultation with the Science Coordinator and staff specialists, will determine the appropriate instrument for authorizing research work, which must be documented and approved via a permit. Typical permits issued for scientific research include land use permit (2920-1), right-of-way grant (SF299), or casual use letter (as defined in 43 CFR 2920.0-5 (k)). For proposals that are directly related to science needs identified in this strategic science plan BLM may be interested in developing partnerships with potential collaborators to investigate those science needs.

Activities that do not cause appreciable damage or disturbance to the public lands, their resources, or improvements, and which are not prohibited by closure of the lands to such activities, may be determined to be casual use and not require a permit from BLM. Requests for a determination of casual use may be made by letter or email in enough detail for BLM personnel to determine whether the activity intended meets the casual use definition. Where the activity is determined to meet the definition, a letter will be issued by the Authorized Officer indicating no permit is required.

Where a permit is required, arranging a pre-application meeting with BLM staff is encouraged. Applicants can submit Application and Permit Form 2920-1. The application must contain enough detail for BLM personnel to determine potential impacts to public lands. Details of the proposed activity should contain specific locations to be impacted; access needs; a detailed

description of the activity and equipment to be used; mode of access; times of year the activity will occur. The application should include a map of sufficient scale to allow all required information to be legible, and a schedule of intended construction (where applicable). Applicants should submit their application well in advance of planned activity -anywhere from 3 to 6 months in advance to allow for the appropriate level of environmental review. BLM's goal for resolution of this type of request is to reach a decision within 60 calendar days of receipt of a complete application. If an application cannot be processed within that 60-day period, BLM is required to inform the applicant of that fact prior to the 30th calendar day and state when a final decision may be expected. If there are questions about submitting a proposal contact the Steese NCA Manager/Science Coordinator. Applicants should clearly understand that no action related to the proposal may be taken on BLM-managed lands prior to issuance of an authorization.

If it is determined that a permit is needed, applicants may be required to reimburse the U.S. for reasonable administrative and other costs incurred by the U.S. in processing the land use authorization application, and in monitoring construction, operation, maintenance, and rehabilitation of the public lands affected. Cost recovery fees for processing the application and monitoring the use are set yearly by BLM HQ fee schedule (43 CFR 2920.6). FY22 fees range from $136-$1,296, depending on the number of federal work hours required to process and monitor the permit. Federal, State, and local government agencies, their agents and instrumentalities are exempt from payment of rent for use of public lands (43 CFR 2920.8).

The appropriate level of environmental review will be determined based on the scope of the proposal and can range from a categorical exclusion up to an environmental impact statement. The Science Coordinator or delegated staff will contact the primary investigator to discuss permitting requirements and processing timelines. In accordance with 43 CFR 2920.6, the applicant will be required to pay the estimated processing cost prior to BLM initiating an environmental review.

All applications and approved actions will be tracked. At present this occurs internally on a spreadsheet accessible to appropriate staff members of the EIFO. In February of 2022, BLM launched a public pilot test of the standardized permitting system for scientific research called *RAPTOR*, which will evaluate the feasibility and effectiveness of the system prior to full launch for generalized use by the public. Should RAPTOR be adopted for use in the Steese NCA and EIFO, permit processing procedures may evolve as part of the RAPTOR system.

A summary of research approved projects will be published and updated regularly on the Steese NCA and/or White Mountains NRA websites (specific locations will not be included on the public webpage to discourage theft or vandalism of equipment). Unauthorized equipment placed on public lands without a permit are considered a trespass. Where the party in trespass is known, they will be notified of such trespass and held liable to the U.S. for administrative costs, fair market value rent, penalties, rehabilitating, and stabilizing cost associated with the trespass as deemed necessary by the Authorizing Officer. At the discretion of the Authorized Officer, an application to permit the activity may be accepted. Otherwise, resolution of the trespass will require removing all equipment from public lands.

Where the party in trespass is unknown, a trespass notice will be posted on the property, in the closest courthouse, post office, local BLM office, and other public places as appropriate. The notice will also be published in a local newspaper having general circulation in the vicinity of the property. If the notice evokes no response within the timelines established in law, and other attempts to locate the party are unsuccessful, BLM will complete an affidavit of diligent search, take possession, and dispose of the property.

Section 6. Organization and Communication of Completed Science

Internal

Ongoing research projects within the Steese NCA and White Mountains NRA will be tracked. At present this tracking occurs via spreadsheets stored in a shared drive accessible to all EIFO staff members. The Steese NCA Manager, Science Coordinator, or a resource specialist will present a summary of the key findings of completed science during regularly scheduled staff meetings. Reports and published science will be stored in a share drive accessible to all EIFO Staff Members.

External

The Steese NCA Manager, in coordination with the Fairbanks District Public Affairs Officer, will publish periodic updates on science projects within the Steese NCA on the NCA websites. These updates may include short informational videos or written descriptions of ongoing or completed research, public presentations, and citations of published research papers. Projects will also be reported in the annual NCA Manager's report as appropriate.

Integrating Science into Management

The Steese Record of Decision and RMP (2016) calls for an adaptive management approach based on recurring plan evaluations. The next such evaluation will take place in 2023 and be repeated every five years for the life of the plan. These evaluations will be based, in part, on the findings of new research and resource monitoring efforts.

Each proposed activity authorized on BLM managed lands is reviewed by an Interdisciplinary Team of subject matter experts during a NEPA review process. During this process subject matter experts review proposed activities to determine what impacts to resources may result from the proposed activity. If it is determined that there may be an impact, mitigation measures may be required to address the impacts. The level at which an activity is authorized is usually at the Field Manager level and the Field Manager is required to use the best available science to make a science informed decision when authorizing an activity. Science conducted in

the Steese NCA will be used during the review process to determine potential impacts from actions proposed on BLM administered lands.

Science also informs development and refinement of management priorities that drive funding, staffing, and partnering decisions. Current management priorities include leveraging BLM-Alaska's special designation units, such as WSR Units, NCAs, and RNAs to advance conservation, climate change research, and landscape resilience. Field Office management priorities tiered from that are informed by available science and shaped by filling science needs.

Section 7. Science Plan Review and Approval

This Plan will be used as the basis for conducting research in the Steese NCA and White Mountains NRA. As a living document, this plan will be updated on an as-needed basis. The most current version will be made available on the National Conservation Lands Scientific Research website:
blm.gov/programs/national-conservation-lands/about/science-on-the-lands

Science Plan Review and Approval

Science Coordinator VACANT
Steese National Conservation Area

TIMOTHY HAMMOND Digitally signed by TIMOTHY HAMMOND
Date: 2023.03.16 13:07:21 -08'00'

Field Manager
Eastern Interior Field Office

ZACH MILLION Digitally signed by ZACH MILLION
Date: 2023.03.16 13:19:04 -08'00'

National Conservation Lands Lead
BLM Alaska

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Appendix 1 – Congressional Designation

TITLE IV--NATIONAL CONSERVATION AREA AND NATIONAL RECREATION AREA

§401. Establishment of Steese National Conservation Area.
§402. Administrative provisions.
§403. Establishment of White Mountains National Recreation Area.
§404. Rights of holders of unperfected mining claims.
§1312. Administration of the White Mountains National Recreation Area.

ESTABLISHMENT OF STEESE NATIONAL CONSERVATION AREA §401. (a) In order to provide for the immediate and future protection of the lands in Federal ownership within the framework of a program of multiple use and sustained yield and for the maintenance of environmental quality, the Steese National Conservation Area is hereby established.

(b) The Steese National Conservation Area shall include approximately one million two hundred twenty thousand acres of public lands, as generally depicted on the map entitled "Steese National Conservation Area proposed" and dated October 1978. Special values to be considered in planning and management of the area are caribou range and Birch Creek.

ADMINISTRATIVE PROVISIONS §402. (a) Subject to valid existing rights, the Secretary, through the Bureau of Land Management, shall administer the Steese National Conservation Area established in §401 pursuant to the applicable provisions of the Federal Land Policy and Management Act of 1976 dealing with the management and use of land in Federal ownership, and shall, within five years of the date of enactment of this Act, develop a land use plan for each such area, and for the area established in §403.

(b) No public lands within the national conservation area shall be transferred out of Federal ownership except by exchange pursuant to §206 of the Federal Land Policy and Management Act. Where consistent with the land use plans for the area, mineral development may be permitted pursuant to the Mineral Leasing Act of 1920, as amended, and supplemented (30 U.S.C. 181-287) or the Materials Act of 1947, as amended (30 U.S.C. 601-603). Subject to valid existing rights, the minerals in Federal lands within national conservation areas are hereby withdrawn from location, entry, and patent under the United States mining laws (30 U.S.C. 22-54). Where consistent with the land use plan for the area, the Secretary may classify lands within national conservation areas as suitable for locatable mineral exploration and development and open such lands to entry, location, and patent under the United States mining laws (30 U.S.C. 22-54).

(c) Subject to valid existing rights, all mining claims located within any such unit shall be subject to such reasonable regulations as the Secretary may prescribe to assure that mining will, to the maximum extent practicable, be consistent with protection of the scenic, scientific, cultural, and other resources of the area and any patent issued after the date of enactment of this Act shall convey title only to the minerals together with the right to use the surface of lands for mining purposes subject to such reasonable regulations as the Secretary may prescribe as aforesaid.

ESTABLISHMENT OF WHITE MOUNTAINS NATIONAL RECREATION AREA §403. There is hereby established the White Mountains National Recreation Area containing approximately one million acres of public lands, as generally depicted on the map entitled "White Mountains National Recreation Area proposed" and dated October 1978. Subject to valid existing rights, the Secretary shall administer the area in accordance with the provisions of §1312 and other applicable provisions of this Act, the Federal Land Policy and Management Act of 1976, and other applicable law. In planning for the recreational use and management of this area, the Secretary shall work closely with the State of Alaska.

RIGHTS OF HOLDERS OF UNPERFECTED MINING CLAIMS §404. (a) The term "unperfected mining claim" as used in this section, means a mining, claim which is located on lands within the boundaries of the White Mountains National Recreation Area or Steese National Conservation Area established pursuant to this title with respect to which a valid mineral discovery within the meaning of the mining laws of the United States, was not made as of the date of the withdrawal of such area from further appropriation under the mining laws of the United States.

(b) MORATORIUM ON CONTEST PROCEEDINGS. --Any holder of an unperfected mining claim seeking to protect such claim pursuant to this section must have maintained and must continue to maintain such claim in compliance with applicable Federal and State laws, and where applicable, must have obtained and complied with any mining access permit requirements imposed by the Department of the Interior during the 1979 mining season. Prior to September 30, 1982, no unperfected mining claim which has been maintained in accordance with this subsection shall be contested by the United States for failure to have made a valid mineral discovery within the meaning of the mining laws of the United States: *Provided*, That such claim shall be diligently prosecuted during this moratorium on contest proceedings as a condition for the moratorium. Any mining operation undertaken pursuant to this subsection, including but not limited to exploration, development, and extraction, shall be subject to such reasonable regulations as the Secretary may prescribe to assure that such operations will, to the maximum extent practicable, be consistent with protection of the scenic, scientific, cultural, and other resources of the Steese National Conservation Area or the White Mountains National Recreation Area or any affected conservation system units established or expanded by this Act.

(c) VALID MINERAL DISCOVERY.--If the holder of an unperfected mining claim notifies the Secretary by filing an application for a patent that, as a result of mining operations in compliance with the requirements of subsection (b), he has made a valid mineral discovery on such claim within the meaning of the mining laws of the United States, and if the Secretary determines that such claim contains a valid mineral discovery, the holder of such claim shall be entitled to the issuance of a patent only to the minerals in such claim pursuant to the mining laws of the United States. The holder of such a patent shall also be entitled to the use of so much of the surface estate of the lands comprising the claim as may be necessary for mining purposes: *Provided*, That all mining operations conducted upon a claim after such a valid mineral discovery has been made, shall be in accordance with such reasonable regulations as may be issued by the Secretary pursuant to the authority granted in subsection (b) of this section.

(d) VALIDITY DETERMINATION. --If an application for a patent is filed by the holder of an unperfected mining claim pursuant to subsection (c) or if a contest proceeding is initiated by the United States after September 30, 1982, the validity of each claim shall be determined as of the date of the patent application or September 30, 1982, whichever is earlier. The holder of an unperfected mining claim not subject to a patent application filed prior to September 30, 1982, shall submit to the Secretary within one hundred and eighty days after such date all mineral data compiled during the contest proceeding moratorium which would support a valid mineral discovery within the meaning of the mining laws of the United States. Failure to submit such data within the one-hundred-and-eighty-day period shall preclude its consideration in a subsequent determination of the validity of each affected claim. Except as specifically provided for in this section, nothing shall alter the criteria applied under the general mining laws of the United States to adjudicate the validity of unperfected mining claims.

(e) ACCESS TO CLAIMS. --Pursuant to the provisions of this section and §1110 of this Act, reasonable access shall be granted to an unperfected mining claim for purposes of making a valid discovery of mineral until September 30, 1982.

(f) PREFERENCE RIGHTS.--The holder of any unperfected mining claim which was, prior to November 16, 1978, located, recorded, and maintained in accordance with applicable Federal and State laws on lands located within the boundaries of the Steese National Conservation Area, or the White Mountains National Recreation Area established by this title, shall be entitled during a two-year period after the date that the Secretary exercises his authority under §402 or §1312 to open an area containing such claim to mining, (1) to a preference right to rerecord his claim under applicable law and to develop

such claim under §402 or (2) to obtain a lease to remove nonleasable minerals from the claim under §1312.

ADMINISTRATION OF THE WHITE MOUNTAINS NATIONAL RECREATION AREA §1312 (a) The White Mountains National Recreation Area established by this Act shall be administered by the Secretary in order to provide for public outdoor recreation use and enjoyment and for the conservation of the scenic, scientific, historic, fish and wildlife, and other values contributing to public enjoyment of such area. Except as otherwise provided in this Act, the Secretary shall administer the recreation area in a manner which in his judgment will best provide for (1) public outdoor recreation benefits; (2) conservation of scenic, scientific, historic, fish and wildlife, and other values contributing to public enjoyment; and (3) such management, utilization, and disposal of natural resources and the continuation of such existing uses and developments as will promote, or are compatible with, or do not significantly impair public recreation and conservation of the scenic, scientific, historic, fish and wildlife, or other values contributing to public enjoyment. In administering the recreation area, the Secretary may utilize such statutory authorities available to him for the conservation and management of natural resources as he deems appropriate for recreation and preservation purposes and for resource development compatible therewith.

(b) The lands within the recreation area, subject to valid existing rights, are hereby withdrawn from State selection under the Alaska Statehood Act or other law, and from location, entry, and patent under the United States mining laws. The Secretary under such reasonable regulations as he deems appropriate, may permit the removal of the nonleasable minerals from lands or interests in lands within the recreation area in the manner described by section 10 of the Act of August 4, 1939, as amended (43 U.S.C. 387), and he may permit the removal of leasable minerals from lands or interests in lands within the recreation areas in accordance with the mineral leasing laws, if he finds that such disposition would not have significant adverse effects on the administration of the recreation areas.

(c) All receipts derived from permits and leases issued on lands or interest in lands within the recreation area under the mineral leasing laws shall be disposed of as provided in such laws; and receipts from the disposition of nonleasable minerals within the recreation area shall be disposed of in the same manner as moneys received from the sale of public lands.

Appendix 2 – Code of Scientific and Scholarly Conduct

A. All Departmental Employees, and all Volunteers, Contractors, Cooperators, Partners, Permittees, Lessees, and Grantees as described in section 3.3 (Scope) of this chapter, will abide by the following code of scientific and scholarly conduct to the best of their ability.

(1) I will act in the interest of the advancement of science and scholarship for sound decision making, by using the most appropriate, best available, high quality scientific and scholarly data and information to support the mission of the Department.
(2) I will communicate the results of scientific and scholarly activities clearly, honestly, objectively, thoroughly, accurately, and in a timely manner.
(3) I will be responsible for the resources entrusted to me, including equipment, funds, my time, and the employees I supervise.
(4) I will adhere to the laws and policies related to protection of natural and cultural resources and to research animals and human subjects while conducting science and scholarship activities.
(5) I will not engage in activities that put others or myself in an actual or apparent conflict of interest.
(6) I will not intentionally hinder the scientific and scholarly activities of others or engage in scientific and scholarly misconduct.
(7) I will clearly differentiate among facts, personal opinions, assumptions, hypotheses, and professional judgment in reporting the results of scientific and scholarly activities and characterizing associated uncertainties in using those results for decision making, and in representing those results to other scientists, decision makers, and the public.
(8) I will protect, to the fullest extent allowed by law, the confidential and proprietary information provided by individuals, communities, and entities whose interests and resources are studied or affected by scientific and scholarly activities.
(9) I will be responsible for the quality of the data I use or create and the integrity of the conclusions, interpretations, and applications I make. I will adhere to appropriate quality assurance and quality control standards, and not withhold information that might not support the conclusions, interpretations, and applications I make.
(10) I will be diligent in creating, using, preserving, documenting, and maintaining scientific and scholarly collections, records, methodologies, information, and data in accordance with federal and Departmental policy and procedures.

B. In addition, for Scientists and Scholars:

(1) I will place quality and objectivity of scientific and scholarly activities and reporting of results ahead of personal gain or allegiance to individuals or organizations.
(2) I will maintain scientific and scholarly integrity and will not engage in fabrication, falsification, or plagiarism in proposing, performing, reviewing, or reporting scientific and scholarly activities and their products.
(3) I will fully disclose methodologies used, all relevant data, and the procedures for identifying and excluding faulty data.

(4) I will adhere to appropriate professional standards for authoring and responsibly publishing the results of scientific and scholarly activities and will respect the intellectual property rights of others.
(5) I will welcome constructive criticism of my scientific and scholarly activities and will be responsive to their peer review.
(6) I will provide constructive, objective, and professionally valid peer review of the work of others, free of any personal or professional jealousy, competition, non-scientific disagreement, or conflict of interest. I will substantiate comments that I make with the same care with which I report my own work.

C. In Addition, for Decision Makers:

(1) I will do my best to support the scientific and scholarly activities of others and will not engage in dishonesty, fraud, misrepresentation, coercive manipulation, censorship, or other misconduct that alters the content, veracity, or meaning or that may affect the planning, conduct, reporting, or application of scientific and scholarly activities.
(2) I will offer respectful, constructive, and objective review of my employees' scientific and scholarly activities and will encourage their obtaining appropriate peer reviews of their work. I will respect the intellectual property rights of others and will substantiate comments that I make about their work with the same care with which I carry out and report the results of my own activities.
(3) I will adhere to appropriate standards for reporting, documenting, and applying results of scientific and scholarly activities used in decision making and ensure public access to those results in accordance with Departmental policy and established laws

Appendix 3 – Management Objectives and Priority Science Needs

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
Hazard Mitigation and Risk Reduction	Fire, Wildlife, Water/ Watersheds, Climate Change	Manage wildland fire to achieve natural fire regimes and ecosystem processes dependent upon fire. Use prescribed fire in select areas to improve wildlife habitat.	• How is fire affecting Fortymile Caribou Herd winter range and other seasonal habitats? Develop a fire management strategy to limit impacts of increased fire on caribou range. • How is fire affecting Birch Creek/ Ikhèenjik River water quality? • What is the "natural", historical, or characteristic fire regime of habitats in this area"? Is active fire suppression or other mgt. needed to achieve something close to "natural" or to maintain specific habitats? How are climate and other disturbances altering fire regimes and fire impacts? Is there a known anthropogenic component to the fire regime in this region (for example, traditional or intentional burning)? • How is fire affecting areas underlain by permafrost?	• Describe past fire regime (including fire frequency, size, and intensity), identify environmental factors influencing fire regime, and project future changes, considering climate change and fire management. •Monitor effects of fire on Birch Creek/ Ikhèenjik River water quality and caribou (and other wildlife) habitats and populations and assess potential effects of projected changes. •Develop fire management strategies to maintain healthy wildlife and water quality in the NCA.
Hazard Mitigation and Risk Reduction	Stabilization of Human Disturbance	Provide more tools and approaches for aquatic and riparian habitat reclamation and/or restoration.	Management regulations require BLM to restore disturbed watersheds. Multiple restoration watersheds are included in the RMP and may be utilized to evaluate reclamation techniques that are transferrable to federal lands operators.	-Evaluate new approaches to aquatic and riparian reclamation and restoration. -BLM should consider revisiting all stream reclamation plans to ensure that they will indeed prevent unnecessary undue degradation (CFR 43 3809). -Adopt natural channel design approaches to restore impaired waterways. Expand analysis of what was done in OFR 169 (What works, what doesn't work?)

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
				Determine most effective mining reclamation techniques. • Test new approaches for reclamation. What approaches have been used in past and how does it compare to more recent reclamation techniques? Collected targeted AIM data at sites that may potentially have mining in the future.
Hazard Mitigation and Risk Reduction	Climate Change, Ecosystem Function, Ecosystem Services, Fire, Habitat, Soil, Vegetation	Manage wildland fire to achieve natural fire regimes and ecosystem processes dependent upon fire. Use prescribed fire in select areas to improve wildlife habitat. RMP 2.2.11, Veg-2.	Need to coordinate with the Alaska Fire Science Consortium to determine current science needs to improve understanding of impacts of fire to ecosystems and mitigate fire hazards. Questions: • What is the "natural fire regime" in this era of climate change? • Is it possible to reduce fire in certain habitats, such as lichen-rich caribou habitat?	• Develop novel fire mitigation strategies to maintain healthy wildlife and water quality and to protect people and critical infrastructure. • Determine current and future drivers of wildfire. • Determine how fire regimes are projected to change and how ecosystem processes will be altered. • Determine how wildfire smoke affects air quality and the impacts to human health. • Identify current and future change factors that are occurring. • Identify fire management strategies to maintain healthy wildlife and water quality. • Determine the influence of wildfire on the quality of caribou winter range and other seasonal habitats.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
Maintain ecosystem function, resilience, and landscape connectivity	Water/ Watersheds, Ecosystem Services, Ecosystem Function	Where priority fish species are present, manage and monitor habitats to promote self-sustaining populations. Maintain stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment input and transport) under which the riparian and aquatic ecosystems developed. (RMP 2016, Section 2.2.6)	• What are the current and projected (next 25-50 years) threats to aquatic habitat, priority fish species, stream channel integrity, channel processes and sediment regime? • What instream flows are necessary to support healthy aquatic habitats for priority fish species? • What water quality parameters (turbidity, pH, dissolved oxygen, temperature) are necessary to support healthy aquatic habitats for priority fish species? • What stream channel morphology characteristics are necessary to support healthy aquatic habitats for priority fish species? • What seasonal (winter/summer) instream flows, water quality, stream morphology, climates are necessary to support healthy aquatic habitats for priority fish species? • How will current and projected (next 25-50 years) landscape changes impact aquatic habitats for priority fish species?	• Implement inventory and monitoring programs such as BLM Aquatic AIM for priority fish species within the Steese NCA. • Develop an inventory and monitoring strategy (example: Aquatic AIM) to determine primary risks to maintaining healthy aquatic habitats for priority fish species over the next 25-50 years. • Determine how projected climate change over the next 25-50 years may impact aquatic ecosystems for priority fish species and develop effective management strategies to help mitigate potential adverse impacts. • Cooperate and coordinate with state agencies, federal agencies, Native organizations, and other groups to ensure effective program implementation toward conservation of priority fish species using Aquatic AIM methods or eDNA methods to assess fish biodiversity.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
Maintain ecosystem function, resilience, and landscape connectivity	Water/ Watersheds, Habitat, Vegetation, Ecosystem Function, Fish	Manage instream flows to support Proper Functioning Condition (PFC) /healthy riparian and aquatic habitats, which promote the stability and effective function of stream channels, and the ability to effectively route flood discharges. (RMP 2016, Section 2.2.6)	• What instream flows are necessary to support healthy riparian and aquatic habitats? • What current and projected (next 25-50 years) threats are there to instream flow regimes that are necessary to support heathy riparian and aquatic habitats? • How can the BLM best focus management on entire watersheds using an ecosystem approach and involve all interested landowners and affected parties where feasible? • How can BLM ensure that watersheds are in (or are making significant progress toward) a properly functioning physical condition that includes their upland, riparian, wetland, and aquatic habitat? • What are the current and projected (next 25-50 years) threats to proper functioning wetland and riparian areas?	•Implement Wetland/ Riparian AIM program to evaluate condition of riparian and aquatic habitats within the Steese NCA. • Develop strategy to determine primary risks to maintaining healthy riparian and aquatic habitats over the next 25-50 years. • Develop water quantity monitoring strategy for Steese NCA watersheds to document natural timing and variability of water quantity. • Determine how projected climate change over the next 25-50 years may impact riparian and aquatic ecosystems and develop effective management strategies to help mitigate potential adverse impacts. • Cooperate and coordinate with state agencies, federal agencies, Native organizations, and other groups to ensure efficient and effective program implementation toward Proper Functioning Condition of riparian and aquatic habitats. Implement BLM Wetland/ Riparian AIM program.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
Maintain ecosystem function, resilience, and landscape connectivity	Soil, Vegetation, Habitat, Water/ Watersheds	Ensure that watersheds are in (or are making significant progress toward) a properly functioning physical condition that includes their upland, riparian, wetland, and aquatic areas. The infiltration and permeability rates, moisture storage, and stability of upland soils are appropriate to the watershed's soil, climate, and landform. Design all BLM-authorized surface-disturbing activities to reduce soil erosion and minimize impacts to soil profiles. (RMP 2016, 2.2.9).	• What existing BMPs are effective now and which BMPs would be expected to be effective in the future? • How will BLM ensure water and nutrient cycling and energy flow occur effectively to support healthy, productive, diverse communities at levels appropriate to the potential/capability of the site/soils? • How should BLM maintain ecosystem function, resilience, and landscape connectivity? • What mitigation measures should BLM authorized activities include to reduce soil erosion and sedimentation? • Are there management actions that could impact seed dispersal? • Will our ability to mitigate soil erosion change under expected climate change scenarios?	• Develop landscape/watershed strategy to minimize soil erosion and mitigate impacts to soils from management authorized surface disturbing activities. • Implement a soils and permafrost inventory (mapping) and monitoring program to include identification/classification of soil erodibility hazard areas and evaluation of mitigation strategies to minimize disturbance of highly erodible soils. • Evaluate how projected climate change/ ecosystem shifts over the next 25-50 years may impact soil resources in the Steese NCA and identify effective management strategies to mitigate soil erosion, maintain ecosystem function, and maintain landscape resilience. • Develop understanding of management actions that could impact seed dispersal through introduction of nonnative species or limit dispersal of native populations.
Maintain Resources and Values (caribou, Dall's sheep, Birch Creek)	Water Quality, Ecosystem Function	Birch Creek WSR management objectives: Protect Water Quality. Each WSR component will be managed to protect and enhance the values for which the river was designated with protection of water quality and quantity as a principal goal (RMP 2016, Section 2.2.13).	Determine which best management practices will help meet State of Alaska water quality standards and remove upper Birch Creek/ Ikhèenjik River tributaries from the State's impaired waters list. Need to continue to monitor water quality and stream flow monitoring in the Steese NCA and tributaries outside of the NCA boundary that are on the impaired waters list. • How are BLM management actions affecting water quality in the Steese NCA?	• Develop water quality/hydrometeorological monitoring strategy for Steese NCA watersheds to evaluate water quality condition of lentic and lotic systems within the Steese NCA. • Develop strategy to determine primary risks to maintaining or meeting water quality standards in Steese NCA watersheds over the next 25-50 years. • Determine how projected climate change over the next 25-50 years may impact water

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
			• How are State of Alaska management actions affecting water quality in the Steese NCA? • How is Climate Change affecting water quality in the Steese NCA? • How will projected (next 25-50 years) climate change factors affect water quality in Steese NCA? • How should BLM management practices change to address any projected (next 25-50 years) adverse changes to water quality? • How will current and projected (next 25-50 years) erosion and sedimentation from thawing permafrost impact water quality? • How will changes in the active zone of permafrost areas affect water quality? • What are the physical stream and watershed characteristics (including landforms such as glaciers, permafrost, and snowfields/snowpack) that maintain or enhance desired water quality conditions?	quality and develop effective management strategies to help mitigate potential adverse impacts. • Cooperate and coordinate with state agencies, federal agencies, Native organizations, and other groups to ensure effective program implementation to meet and/or maintain water quality standards.
Maintain Resources and Values (caribou, Dall's sheep, Birch Creek)	Water/ Watersheds	Ensure availability of surface and ground water for public land management purposes by acquiring and protecting federal reserved water rights and water rights obtained through state-based administrative and judicial systems. (RMP 2016, Section 2.2.13)	• How will BLM acquire and maintain instream flow water reservations for Birch Creek WSR? • How are BLM management actions affecting water quantity in the Steese NCA. • How are State of Alaska management actions affecting water quantity in the Steese NCA. • How will changes in precipitation timing and type (rain/snow) affect quantity of streamflow?	• Develop water quantity/hydrometeorological monitoring strategy for Steese NCA watersheds to document natural timing and variability of water quantity. • Develop strategy to determine primary risks to maintaining natural timing and variability of water quantity in Steese NCA watersheds over the next 25-50 years. • Determine how projected climate change over the next 25-50 years may impact water

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
			• How will changes in the active zone of permafrost areas affect water quantity? • How will groundwater flow paths be affected by changes in permafrost? • How will projected (next 25-50 years) climate change affect water quantity in the Steese NCA? • How are projected flow regimes expected to shift in the next 25-50 years? • Will BLM management practices need to change to address any projected (next 25-50 years) adverse changes to water quantity/water rights instream flow. • How will BLM accomplish Birch Creek WSR r management objectives: preserving the river and its immediate environment in a natural, primitive condition; preserving its free-flowing condition. • What are the physical stream and watershed characteristics (including landforms such as glaciers, permafrost, and snowfields/snowpack) that maintain or enhance desired water quantity conditions?	quantity and develop effective management strategies to help mitigate potential adverse impacts. • Cooperate and coordinate with state agencies, federal agencies, and other stakeholder groups to develop instream flow water rights for Birch Creek WSR. • Work cooperatively with other agencies to monitor changes in permafrost. • Develop water quantity and quality studies focused on basins most susceptible to permafrost thaw.
Maintain Resources and Values (caribou, Dall's sheep, Birch Creek)	Recreation, Wild & Scenic River, Water/ Watersheds	Birch Creek WSR management objectives: The focus this zone would be to provide high quality, multi-day recreational float boat opportunities for users who desire a recreation experience characterized by solitude, tranquility, self-reliance, challenge, and risk	Monitor semi-primitive setting characteristics and visitor satisfaction. Determine thresholds of use and current and future threats to setting and satisfaction.	• Monitor status and trends of Birch Creek/ Ikhèenjik River semi-primitive setting characteristics and visitor satisfaction. • Determine thresholds of use and current and future threats to setting and satisfaction.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
		in a semi-primitive Interior Alaska river setting, on one of America's nationally designated wild rivers. (BLM 2016, Section 2.2.20).		
Maintain Resources and Values (caribou, Birch Creek)	Water/ Watersheds, Wild & Scenic River, Fish, Habitat	Birch Creek WSR management objectives: protect and enhance outstandingly remarkable river-related values: FISH POPULATION AND HABITAT (BLM 2016, Section 2.2.26). Protect outstandingly remarkable river-related values, water quality, and free-flowing condition of rivers designated as components of the National WSR System. (BLM 2016, Section 2.2.26) Appendix E, Outstandingly Remarkable Values for Birch Creek WSR, Fish Population and Habitat Finding: Birch Creek/ Ikhèenjik River has one of the highest diversity of fish of all rivers in the region. This diversity makes fisheries an outstanding	• Where are the seasonally important priority fish habitats and what are their characteristics? • How are fish habitats changing and where are fish habitats predicted to be in the future? • Is BLM adequately protecting the fish population and habitat Outstandingly Remarkable Values of Birch Creek/Ikhèenjik River? • How can BLM enhance the fish populations and habitat? • What are current and future threats to fish and their habitat? • How should BLM mitigate the threats to fish and their habitat?	• Inventory important fish habitats. • Establish methods for monitoring the status and trends of those sites. • Identify methods to sustain fish population and aquatic habitat.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
		remarkable value for Birch Creek WSR.		
Maintain Resources and Values	Habitat	Special values to be considered in planning and management of the area are caribou range and Birch Creek (ANILCA Title IV). Steese NCA Record of Decision and Approved Management Plan 2.2.16 Wildlife Resources Decision Wild-1: In the Steese NCA, manage present and historical caribou habitat as a primary land use. Emphasis will be placed on managing the area to maintain the opportunity for the Fortymile caribou herd to utilize both present and historical use areas.	• What habitats are caribou selecting on a seasonal basis in the Steese NCA and in relation to the full herd distributions? • What caribou habitats are most likely limiting? • How do these habitats contribute to the habitat needs of each herd? • What are the genetic and demographic relationships between the small and more sedentary White Mountains herd and the larger more migratory Fortymile herd? • The Steese NCA is part of the historical calving and post calving range; what management is necessary to retain that value? How does BLM plan for shifting habitat and population ranges?	•Identify key seasonal habitat areas and attributes, potential impacts to those habitats and caribou utilization, and develop mitigation and management strategies. •Identify limiting forages and habitats and the relative importance of different habitats to population performance •Monitor changes in key habitat attributes and areas and project changes under future conditions • Monitor trend, changes in distribution, and interaction of White Mountains and Fortymile Caribou herds. •Create seasonal habitat selection models across the herd range to predict potential future use.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
Maintain Resources and Values	Habitat	*Minimize impacts to wildlife species and their habitats from BLM-authorized activities on BLM-managed lands. (Steese ROD/RMP, 2.2.16) •Protect important Fortymile caribou herd and White Mountains caribou herd calving and post-calving areas by restricting land use activities during times caribou are present (Standard Operating Procedures, Appendix A, Steese ROD/RMP). --Other decisions in the RMP/Record of Decision limit certain activities in delineated caribou winter range, caribou migration corridor, and crucial caribou and Dall sheep habitat.	• What restrictions, stipulations, and Standard Operating Procedures (SOPs) are necessary and effective to avoid negative impacts of permitted activities on caribou and their habitat? • What land use activities affect caribou use of available habitats? What threshold of activity will be effective in maintaining full use by caribou of habitats? Are current management delineations most appropriate? • How can we plan and direct land use activities to minimize effects on caribou habitats and use of them by caribou?	• Identify relative value of critical habitats, timing of their use, and changes in use patterns through time; sensitivity of caribou to human activities and facilities; and develop effective management and mitigation strategies. • Identify and monitor direct impacts of land uses on caribou habitat and develop effective mitigation and reclamation strategies. • Monitor status and trends of those habitats and monitor and evaluate activities and agents that affect habitats and animal use of those habitats (habitat effectiveness).
Maintain ecosystem function, resilience, and landscape connectivity	Ecosystem Function	Encourage and facilitate scientific inquiry in the Steese NCA and White Mountains NRA	• How can BLM encourage and facilitate science work? • How can BLM fund basic inventories that facilitate other work (e.g., soils and vegetation mapping)? • How can BLM address logistical constraints to conduct scientific work in the Steese NCA? Access? • How can BLM ease permitting and other restrictions to scientific work?	• Develop a strategy to facilitate scientific inquiry in the Steese NCA and adjacent White Mountains NRA. • Address barriers to conduct scientific work in the Steese NCA, including logistical constraints, awareness, and interest in conducting research by the scientific community, funding & capacity limitations, and permitting restrictions.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
Sustainable Economies and Livelihoods	Mitigation, Mining/ Mineral Resources	Mining-related disturbances will be rehabilitated, on active and inactive workings, as required by 43 CFR 3809 and in accordance with SOPs and BLM's policy.	• Need to determine how to successfully restore and reclaim mines. • Need to monitor and evaluate reclamation efforts at placer mining sites to ensure that all reclamation requirements have been achieved. Short and long-term studies at these sites would be useful for evaluating future mine proposals as well as assessing the efficacy of reclamation techniques.	• Understand how to successfully restore properly functioning (healthy) stream, riparian, and vegetation conditions. Are our current practices effective? • Determine if there are there more effective tools available to enhance reclamation needs. • Determine what tools / technology are available in addressing future climate change. • Implement terrestrial, aquatic and wildlife inventory and monitoring program to evaluate mitigation efforts.
Sustainable Economies and Livelihoods	Use and Access	ANILCA Title VIII establishes a priority for the "customary and traditional uses" of these subsistence resources by all rural residents of Alaska on federal public lands	• How are federal subsistence users accessing and using the Steese NCA and White Mountains NRA? • To what extent do federal subsistence users rely on resources provided by the Steese NCA and White Mountains NRA and how might needs and uses change in the future (e.g., with changing availability of resources such as salmon and changing harvest pressures on fish and wildlife in the Steese NCA and White Mountains NRA and in other areas)?	• Understand different subsistence user practices, traditional uses and present and future needs. • Understand changing subsistence and non-subsistence harvest pressure from local and regional areas and their impact on the Steese NCA area. • Determine what drivers affect subsistence use (e.g., changes in technology; future travel management; resource availability, access to subsistence resources, quality and quantity of subsistence resources) • Understand the conflicts between other user groups and subsistence users. Determine methods to minimize conflicts between visitors • Understand how subsistence resource availability and access to resources are changing and how to adapt to these changes.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
Sustainable Economies and Livelihoods	Water/ Watersheds, Ecosystem Services, Ecosystem Function	When authorizing major projects on BLM lands outside of NLCS units, the BLM will look for opportunities to use NLCS units for off-site mitigation to the extent consistent with the designating legislation or proclamation and other applicable law.		Determine opportunities for offsite mitigation inside the Steese NCA (e.g., establish wetland bank in NCA in return for damaging wetland outside of NCA; determine locations of habitat in the Steese NCA that need restoration).
Sustainable Economies and Livelihoods	Recreation	Provide for multiple recreational uses of the public lands. This includes facilitating a wide range of beneficial outcomes by managing for desired recreational activities, settings, and experiences. (BLM 2016, Section 2.2.20) Rec 1: Manage each Recreation Management Zone in the Steese Recreation management Area to protect and enhance the activities, experiences, benefits, and desired recreation setting characteristics described in Tables 12 through 29 (Map 11). Rec-4: On public lands that are not designated as a Special Recreation Management Area, manage	• Is BLM meeting objectives for Recreation Management Zones and lands outside the Special Recreation Management Area? • What thresholds and threats should be considered while monitoring measurable outcome-focused objectives for zones (2016 Resource Management Plan Tables 12-29)? • Do actions and allowed uses 1) sustain or enhance recreation objectives, 2) protect the desired recreation setting characteristics, and 3) constrain uses, including non-compatible recreation activities that are detrimental to meeting recreation or other critical recourse objectives? • How does BLM effectively monitor and evaluate visitor satisfaction including niche decisions, targeted outcomes, and setting character decisions, based on Recreation Management Zone objectives and prescriptions? • Will environmental changes resulting from anticipated climate change alter our ability to provide desired recreation experiences?	• Evaluate and monitor whether the BLM is meeting the Recreation Management Zone prescriptions as outlined in the EIFO 2016 Resource Management Plan. • Evaluate and analyze future recreation activities and use patterns and their potential impact on the current Recreation Management Zones.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
		to meet basic recreation, visitor services, and resource stewardship needs. Address emerging recreation issues as needed. Prioritize actions for remediating recreation issues.		
Sustainable Economies and Livelihoods		Nondestructive soil sampling to determine potential mineral source and approximate resource value. Targeted mapping of potential resource bearing structures. Noninvasive stream sample to project potential location of resource. Baseline data collected, water quality, vegetation cover stream characteristics, etc., to inform requirements for post disturbance reclamation.	Steese NCA is currently withdrawn from mineral location, but this could change in the future. Thus, baseline information about mineral resource potential impacts of development is needed for future management of mineral resources. • Which areas have greatest mineral potential and what information would BLM need to assess and manage impacts? • Are there other scenarios of land use and/or climate change that BLM would want to consider?	Understand how climate change and future economic conditions might affect demand for minerals specific to the Steese NCA.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
Sustainable Management of Species and Habitat	Wildlife, Threatened/ Endangered/ Invasive Species	Address critical knowledge gaps including species presence, abundance and distribution, and habitat type, condition, and abundance. Inventory and monitoring of special status species, priority species (aquatic and terrestrial) and habitats (aquatic and terrestrial)	Significant portions of the Steese NCA are lacking in presence/absence and distribution for most priority and special status aquatic and terrestrial wildlife species. Similarly, the knowledge of occurrence, distribution, condition and trend of vegetation species and communities, aquatic and terrestrial wildlife habitats is limited. This information is needed to inform management of resources and land use.	• Inventory aquatic priority and special status species in Steese and White Mountains. This can be inclusive of presence absence, distribution, & abundance. • Complete our understanding of aquatic habitat condition (and/or value) for priority and special status species. Develop an understanding of the habitat suitability for the various priority and special status species leading to identification of opportunities to address habitat related population bottlenecks. • Inventory and monitor terrestrial priority, special status, and other terrestrial wildlife species in Steese and White Mountains. This can be inclusive of presence absence, distribution, abundance, and trend. This can also include genetic mapping (e.g., monitor White Mountain caribou herd which is genetically distinct herd). • Inventory, monitor, and further classify vegetative communities across the Steese and White Mountains. This can be inclusive of presence/absence, plant cover, distribution, and abundance, as well as other common classifications found in vegetative studies and management plans. • Identify areas of high species diversity and habitats supporting key life history stages for multiple species. • Inventory of and monitoring for invasive species (aquatic, terrestrial). Example science objectives:

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
				• Determine the status and trend of bees and other pollinators. • Identify what species may serve as indicators of environmental change. • Determine how fire affects ungulate habitat and population trends.
Sustainable Management of Species and Habitat	Wildlife, Threatened/ Endangered/ Invasive Species	Prevent special status species from becoming threatened or endangered.	Develop a Special Status Species management plan. Management plans are an essential tool to help avoid species loss (e.g., listing as threatened or endangered, local extirpation). Therefore, a management plan that is informed by science is necessary.	Identify gaps in knowledge of population size and trend, distribution, habitat characteristics and availability, and threats. Assemble such information from across the state. Develop strategies and management recommendations to sustain or recover Special Status Species. Compile in a Special Status Species management plan.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
Sustainable Management of Species and Habitat	Climate Change, Fire, Habitat, Vegetation, Wildlife	How are vegetation communities changing? What will future vegetation look like? Understand and monitor the current structure and make-up of vegetation communities leading to informed management of the resource.	Vegetation communities are changing and will continue to change, especially due to fire in forested areas and warming in alpine areas. Decreases in size and extent of alpine tundra and increases in shrubs are likely. Abundance of black spruce forest will continue to decrease and deciduous forest increase. Invasive species will likely become more common. These and other possible changes will affect fish and wildlife habitat and human uses of the landscape. Need to measure, monitor, and predict these changes and factor them into our management decisions. • How are vegetation communities changing? • What will future vegetation communities look like? • What are the drivers of vegetation change?	• Identify and monitor vegetation and soil responses to climate change and disturbance. • Develop a suite of future condition scenarios for vegetative communities along with relative probabilities (forecasting). • Create Management decision workflow based on the scenarios with management triggers.
Sustainable Management of Species and Habitat	Habitat, Vegetation	Prevent the introduction and spread of noxious and non-native invasive species on and adjacent to BLM-managed lands. RMP 2.2.7 Non-Native Invasive Species	• What invasive species are present in and near the Steese NCA? • What invasive species are projected to spread to the Steese NCA? • What are the potential impacts of these invasive species on habitat and other species? • Which areas or vectors of spread pose the greatest risk for spread?	Inventory and monitor non-native invasive species in the Steese NCA and develop management strategies. • Inventory invasive species within the Steese NCA (plants, animals, insects, pathogens; RMP Decision NIS-3). • Map existing invasive species occupancy and high-risk future areas. • Determine which vectors of spread are most prevalent. Determine how can BLM eliminate or limit the introduction and spread of invasive species. • Determine what management activities (e.g., active restoration) could help reduce or

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
				eliminate risk of invasive spread. Develop management strategies with partners. • Determine how climate change/ ecosystem shifts could advance or limit the spread of invasive species.
Sustainable Management of Species and Habitat		Understand the role of the Steese NCA in supporting breeding bird populations. Identify key habitats.	Need to develop an inventory and monitoring program to determine presence and abundance of breeding birds, focused on species of conservation concern, that can be used to manage habitats and measure future population changes. • How do land use activities impact breeding birds? • What important local and regional habitats for breeding birds exist?	• Determine how do land use activities impact breeding birds, especially species of conservation concern. • Determine geographic location and extent of local and regional habitat for breeding birds. • Determine how climate change affect breeding bird habitat. • Determine how projected change in breeding bird habitat will affect the breeding bird population and distribution. • Determine adaptive capacity of breeding birds.
Travel and Transportation	Use and Access, Soil, Habitat, Vegetation, Threatened/ Endangered/ Invasive Species, Water/ Watersheds, Recreation	Understand how limiting the use of OHVs by weight, seasonal closure, and/or to existing routes or in some cases considering dispersed cross-country travel will help maintain the appropriate recreational setting and minimize environmental degradation.	Recreational OHV use impacts the landscape and resources through trail braiding, user-created trails, and damage to vegetation, erosion, thermokarsting, changes in vegetation composition, and spread of non-native invasive plants. BLM needs to better understand current and developing impacts of OHV use on a wide spectrum of resource values and develop methods to manage OHV use. • Will environmental changes resulting from anticipated climate change alter our ability to provide desired recreation experiences? • How will trails and travel be impacted by	• Determine criteria for designing and maintaining sustainable travel routes for present and future needs (e.g., permafrost impacts, critical resources). • Determine how changes in trail and route design, construction, and maintenance affect user access and numbers in the future. • Determine criteria for the most sustainable trail building and planning. • Determine how to account for future environmental change in trail building plans and OHV use.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
			environmental changes resulting from anticipated climate change?	
Travel and Transportation	Use and Access	The BLM will ensure that rural residents engaged in subsistence uses shall have reasonable access to subsistence resources (ANILCA section 811(a))	• How are federal subsistence users accessing and using the Steese NCA and White Mountains NRA? • What are traditional means of access?	• Understand current subsistence use patterns in the plan area and how that use may change in the future. • Determine what are the drivers that would affect future subsistence user needs (e.g., changing economy, changing technologies, resource availability, user food preferences, access to subsistence resources). • Identify alternative subsistence resources, as future plant and animal food resources shift/change to provide long-term subsistence opportunities for rural residents. • Understand how changes in use and harvest by non-subsistence users may affect subsistence use. • Understand how availability of alternative resources outside the Steese NCA may affect subsistence and non-subsistence use and dependence on resources in the Steese NCA.

PRIORITY AREA	FOCUS	MANAGEMENT OBJECTIVE and RESOURCE VALUE	NEED STATEMENT and SCIENCE QUESTIONS	SCIENCE OBJECTIVES
Sustainable Economies and Livelihoods	Habitat	Maintain sufficient quality and quantity of habitat to support healthy populations of important subsistence species, including moose and caribou.	• What are important habitats for supporting subsistence species? • What affect habitats and how can management affect those habitats and populations?	• Determine factors that affect the long term the sustainability of the Steese NCA/White Mountains NRA's fish and wildlife species • Identify and map the conflicts between different users. • Identify alternative subsistence resources, as future subsistence plant and animal populations shift/change to provide long-term subsistence opportunities.
Travel and Transportation	Soil, Vegetation, Wildlife, Wildlife Habitat, Threatened & Endangered Species, Priority Species, Subsistence	Provide opportunities for a range of motorized and non-motorized uses on public lands while protecting resources and minimizing conflicts among various users (BLM 2016, Section 2.2.22 Goal)	Interior Alaska is a fragile landscape with seasonally frozen ground and permafrost. Traveling on ice-rich permafrost causes thawing, ground degradation and vegetation damage. BLM needs to better understand current and developing impacts on a wide spectrum of resource values and develop methods to manage use. Need to determine where off-road vehicles are causing or will cause considerable adverse effects upon soil, vegetation, wildlife, wildlife habitat, cultural resources, historic resources, threatened or endangered species, wilderness suitability, other authorized uses, or other resources in order to mitigate the adverse effects. Need to determine whether travel and transportation limitations adequately protect resources.	• Identify different user groups and their transportation needs and understand the conflicts between different user groups. • Determine how changes in technology (e.g., UTVs, ATVs, electric bikes) affect transportation needs, access and resources. • Determine how changes in trail and route design, construction, and maintenance affect user access and numbers in the future. • Understand how changes in climate/ecosystems will effect different user groups in the future. • Understand the parameters of designing and maintaining sustainable travel routes for present and future needs (e.g., permafrost impacts, critical resources). • Understand the impacts of specific UTV/ATV weights, seasonal closure, route designations on natural and cultural resources.

Appendix 4- Acronyms

Abbreviation	Definition
AIM	Assessment, Inventory, and Monitoring
ANILCA	Alaska National Interest Lands Conservation Act
BLM	Bureau of Land Management
DOI	Department of the Interior
EIFO	Eastern Interior Field Office
NCA	National Conservation Area
NEPA	National Environmental Policy Act
NLCS	National Landscape Conservation System
NPS	National Park Service
NRA	National Recreation Area
OHV	Off-Highway Vehicle
RMP	Resource Management Plan
RNA	Research Natural Areas
U.S.	United States
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VHF	Very High Frequency
VMAP	Vegetation Management Action Portal
WSR	Wild and Scenic River